the OIL AND GAS JOURNAL

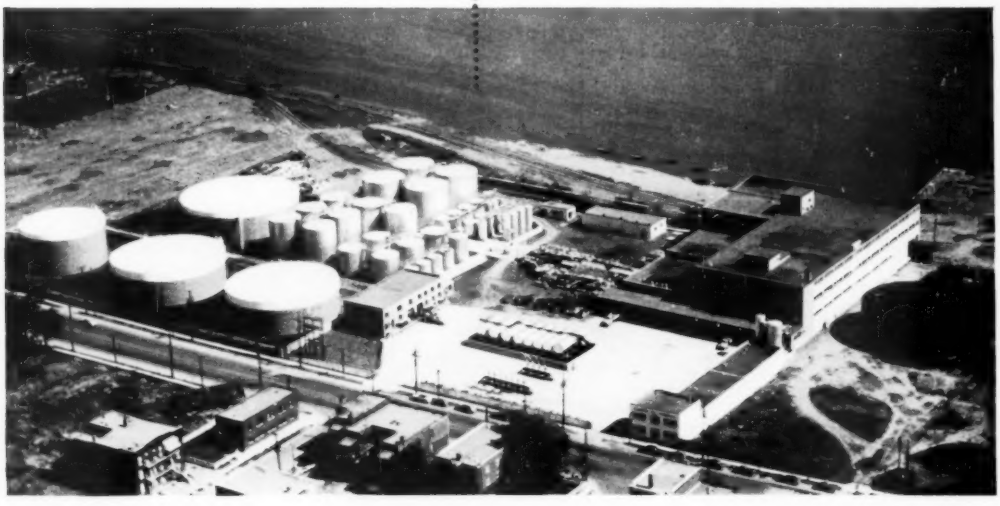
PRICE 50 CENTS TABLE OF CONTENTS PAGE 57 **JANUARY 14, 1952**

"Model" Grease Plant FOR CANADIAN OIL COMPANIES, LTD.

This lucite, scale model was the "blueprint" used by Fluor engineers to plan and construct the new modern lubricating oil and grease manufacturing plant for Canadian Oil Companies, Ltd., in Montreal. Being able to work out detailed designs in miniature, played a big part in the successful selection and location of all equipment to facilitate the natural flow of work through the plant with a significant saving in man hours. It is an example of the thoroughness with which Fluor tackles a job.

Over 300 varieties of specially engineered greases and lubricants packed in a multitude of sizes, from 3 ounce cans to 55 gallon drums, are manufactured, blended, packaged and stored in this efficient plant. It had to be built in a U-shape to incorporate the original plant which still houses much of the blending machinery. It had to be accessible to all forms of transportation by land or water. It had to provide storage facilities for raw grease stocks before processing and for interior storage of finished products. It had to be equipped with the latest automatic devices for heating, blending, sterilizing, conveying, packaging, handling, etc. and it had to be completed in the shortest time possible.

Fluor's experience with building and remodeling plants which use bulk materials for a variety of products, has long been established, but at Canadian Oil much of the machinery is Fluor designed—especially that used for handling materials. The flexibility of this equipment is almost human in its ability to switch from one type of product to another, from one type of container to another and from one type of carrier to another whether it be truck, box car, tank car, freighter or tanker, without loss of time for change-over.



FLUOR

BE SURE WITH FLUOR

Fluor's Engineering and Construction Division is one of the nation's foremost organizations in plant construction, from design to completion. For more information contact your nearest Fluor district office or representative.

DESIGNERS AND CONSTRUCTORS of Refining, Natural Gas and Chemical Processing Plants.
MANUFACTURERS of Pulsation Dampeners, Mufflers, Gas Cleaners, Cooling Towers and Fin-Fan Units.

THE FLUOR CORPORATION, LTD., 2500 S. Atlantic Blvd., Los Angeles 22, California
New York, Chicago, Pittsburgh, Boston, Tulsa, Houston, San Francisco, Birmingham and Calgary.

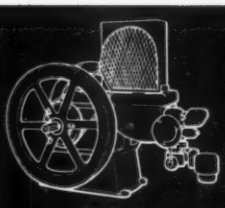
REPRESENTED IN THE STERLING AREAS BY: Head Wrightson Processes Ltd., Teesdale House, Baltic Street, London, E.C.1., England

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910 at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $4 yearly.

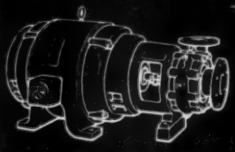
For More in Oil Field Equipment

it's FAIRBANKS-MORSE

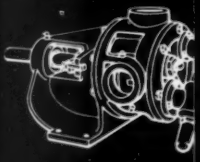
Electric Motors



ZC Engines



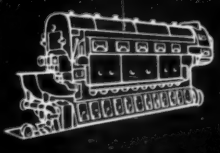
Builtogether Pumps



Rotary Pumps

Power Pumps

Westco Pumps

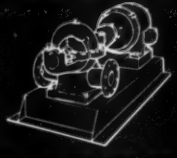


Diesel and Dual Fuel Engines

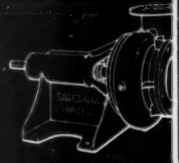
FAIRBANKS-MORSE,

a name worth remembering

OIL FIELD EQUIPMENT • PUMPS • SCALES • ELECTRIC MOTORS
LIGHT PLANTS • DIESEL, DUAL FUEL AND GASOLINE ENGINES
GENERATORS • MAGNETOS



Single and Two-Stage Centrifugal Pumps



Side-Suction Centrifugal Pumps

For logging

For sand and gravel

For aircraft

For marine

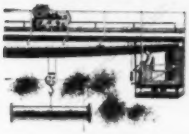
For construction

For stone quarries

For elevators

For mining

For drilling



For industrial

For better service and more economy . . . use

MACWHYTE WIRE ROPE

PREformed and Internally Lubricated

A THOUSAND AND ONE

to order from assures the right rope for your equipment

There is a Macwhyte Wire Rope that has been specially engineered and job-proved for any particular type of equipment you operate. That's why it pays to specify Macwhyte. Over the years, ropes for all types of equipment in every field have been developed by Macwhyte. Recommendations are promptly available either from Macwhyte distributors or Macwhyte Company, 2910 Fourteenth Avenue, Kenosha, Wisconsin.

Ask for these helpful bulletins:

"Wire Rope—So What?" (No. 5134)—Illustrated exclusive interview with veteran wire rope engineer who talks straight from the shoulder about saving hundreds of wire rope dollars.

"How to Order Wire Rope" (No. 5025)—Tells exactly what to consider. Also includes convenient table of sizes, constructions, strengths and weights of Improved Plow Steel Wire Ropes.

Mill depots: New York • Pittsburgh • Chicago • Minneapolis • Fort Worth • Portland • Seattle • San Francisco • Los Angeles. Distributors throughout U. S. A. and other countries carry stocks.

1010

REAL PERSONAL SERVICE

one of many reasons why
HALLIBURTON'S *best*
...for your DRILL STEM TEST!

YOUR TESTER stays on the rig from start to finish when Halliburton tests your well. This highly important operation requires close, full-time, personal attention, and no one is more aware of it than your Halliburton Tester.

He comes fully prepared and equipped to give you a safe, successful, accurate test. He'll do it at a big saving of rigtime for you. The Halliburton Tester is handpicked from a field of high-caliber men for his extraordinary responsibility, efficiency, and capability. Then he is carefully and thoroughly trained on every type of well until he has earned the coveted title of Testing Specialist. This exhaustive training enables him to handle your test no matter how deep the well, how high the pressures or temperatures.

This equipment is the most advanced and specialized in the industry. It was developed by 25 years' grass roots research and improved by service on more than a million wells. The Tester understands every function of these tools. He is particularly proud of the many features that Halliburton *alone* offers – such as the Bourdon Tube Pressure Recording Device, the curved J slots, and automatic locks.

Halliburton has over a hundred Testing Specialists who give real personal service. One of them is only minutes away from you and ready to go as soon as you call. Phone him and he'll have his string made up before you come out of the hole. Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

MORE REASONS WHY HALLIBURTON'S best:

25 YEARS RESEARCH BACKS UP YOUR TEST

Halliburton alone offers a testing service developed and improved by 25 years of energetic, grass roots research.

MOST ADVANCED TOOLS AND TECHNOLOGY

Halliburton's highly specialized tools and exclusive features, its superior knowledge and experience, help make misruns a rarity.

GREATER ACCURACY IN PRESSURE RECORDING

The Bourdon Tube Pressure Recording Device, exclusive with Halliburton, gives you far greater accuracy at no extra cost.

HALLIBURTON

YEARS AHEAD IN DRILL STEM TESTING!

LINK-BELT

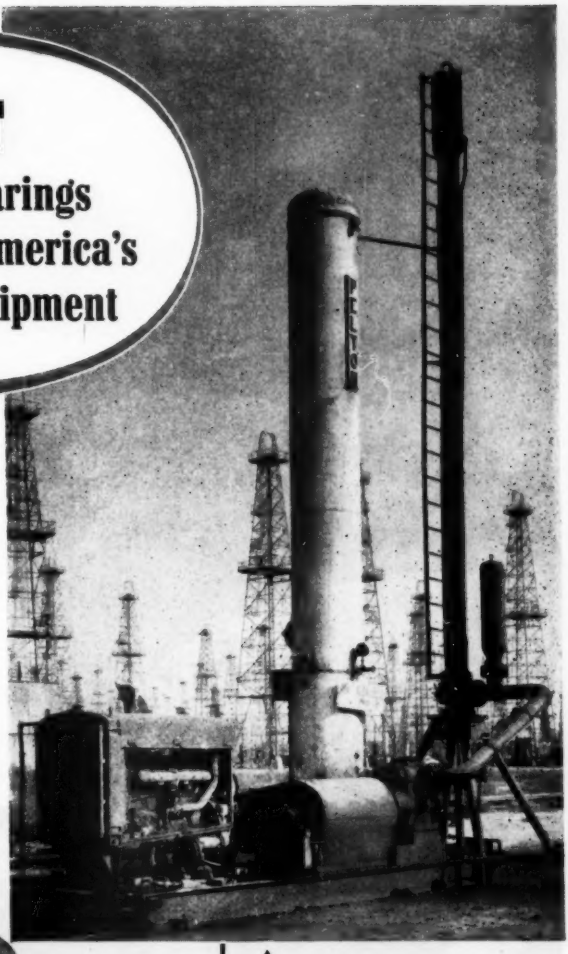
Ball and Roller Bearings keep company with America's hardest working equipment

WHETHER it's a pumping unit or a drilling rig . . . compound or spudder—top oil field designers know they can rely on Link-Belt's complete line of mounted ball and roller bearings.

They've learned that mounting vital rotating parts on precision Link-Belt bearings assures longer machine life . . . greater freedom from wear, excessive lubrication and maintenance expense.

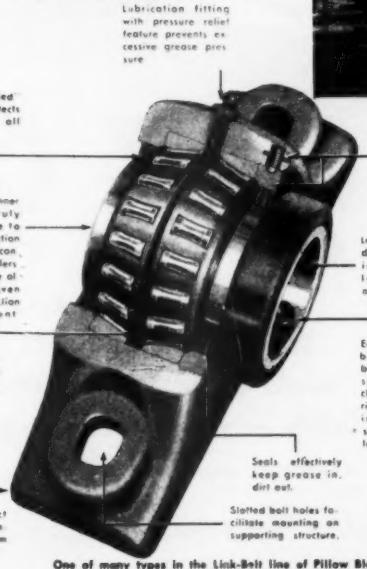
There are sound reasons for this universal acceptance. Foremost is *quality*. At Link-Belt, quality is no idle catchword. It's *real*—the result of continuing research . . . sound engineering . . . highest grade materials . . . skilled craftsmanship . . . rigid inspection.

Let a Link-Belt bearing specialist show you how this unvarying quality can step up your production efficiency and economy. Or you can get complete engineering information from Data Book 2550.



▲ Pelton Pumping Jack operates day in, day out—rain or shine. Rugged Link-Belt series 6800 and 6900 Roller Bearing Pillow Blocks are used exclusively.

CUTAWAY OF SERIES 400 ROLLER BEARING PILLOW BLOCK



One of many types in the Link-Belt line of Pillow Blocks, Flanged, Flanged Cartridge, Cartridge, Hanger, Take-up Blocks and Unmounted Bearings.

LINK-BELT

BALL and ROLLER BEARINGS

LINK-BELT COMPANY: Indianapolis 6, Dallas 1, Houston 1, Los Angeles 33, Kansas City 8, Mo., New York 7, Toronto 8. Distributors in all fields. 12,898

It's TOPS... so it's MARLEY!

GEAREDUCERS

designed specifically for cooling tower fans

Geareducers are designed and built by Marley to do just one job—drive fans up to 264 inches in diameter—and do it better than any other mechanism. Years of research and field service prove Geareducer design provides everything needed to resist thrust set up by huge fans. This includes oversize taper roller bearings; hardened alloy steel gears of scientifically selected ratio; pumpless, continuous splash lubrication, super-strong shafts and cases. Every detail of the design has a specific purpose: consider the wide-spread feet for great stability and the magnetic drain plug that retains any loose particles of metal that might cause wear.

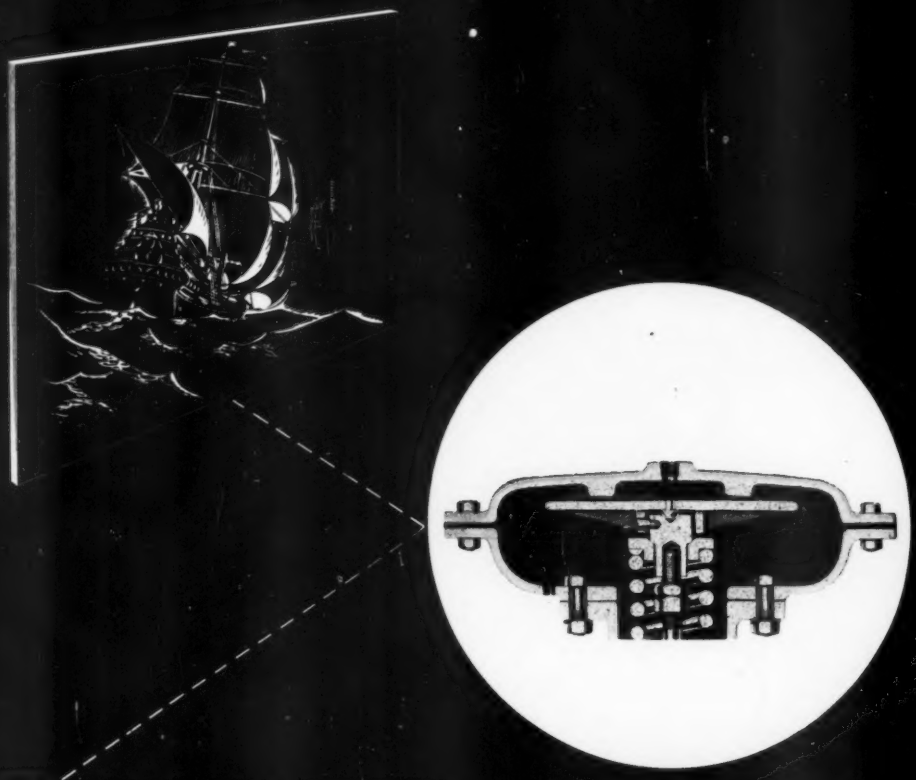
In production all machine processes are constantly inspected with exacting care. When completed, every Geareducer is run in, disassembled, carefully checked part by part, completely coated with moisture resistant grease, and reassembled for shipment.

producers of
DOUBLE FLOW TOWERS
DRICOOLERS
AQUATOWERS
NATURAL DRAFT TOWERS
CONVENTIONAL TOWERS
SPRAY NOZZLES
VAIRFLO TOWERS
DOUBLE FLOW AQUATOWERS

MARLEY

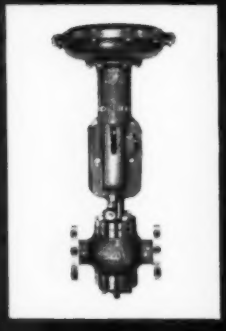
The Marley Company, Inc.

Kansas City 5, Missouri



ROLLING ACTION . . .

for superior spring-diaphragm characteristics



The pre-moulded neoprene diaphragm in the Honeywell Series 700 Valve features rolling action . . . eliminates wrinkling or buckling . . . responds to slightest change in signal air pressure . . . may be used with either air or gas as actuating medium. The Honeywell Series 700 Valve is available in a wide range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-3.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1906 Windrim Ave., Philadelphia 44, Pa.

MINNEAPOLIS

Honeywell

VALVE PRODUCTS

First in Controls

H HONEYWELL

Get more exploration work done per day by switching to a truck that can take it. You'll keep rolling because

this light-duty Model LD is a true 4x4!

SAFE TRANSPORT is furnished by the LD for oilfield equipment and supplies.

AS A WATER CARRIER, this new LD is a real trail blazer for the geophysical fleet.

Your "FWD fleet" is now complete with this spectacular *light-duty* model. It is *factory engineered* to easily do tough jobs that *conventional* trucks and *conversions* have tried to serve. The LD has thoroughly answered demand for a powerful, moderately priced, light-duty FWD. It has a gross vehicle weight of 14,500 lbs. . . . a real truck engine . . . real truck parts! Ask FWD or your FWD distributor for facts. The FOUR WHEEL DRIVE AUTO CO., Clintonville, Wisconsin; Canadian factory, Kitchener, Ontario.

Built by the makers of America's Foremost Heavy-Duty Trucks

You buy more than a truck when you buy an FWD

Extra traction and proper distribution of weight and power give you all this:

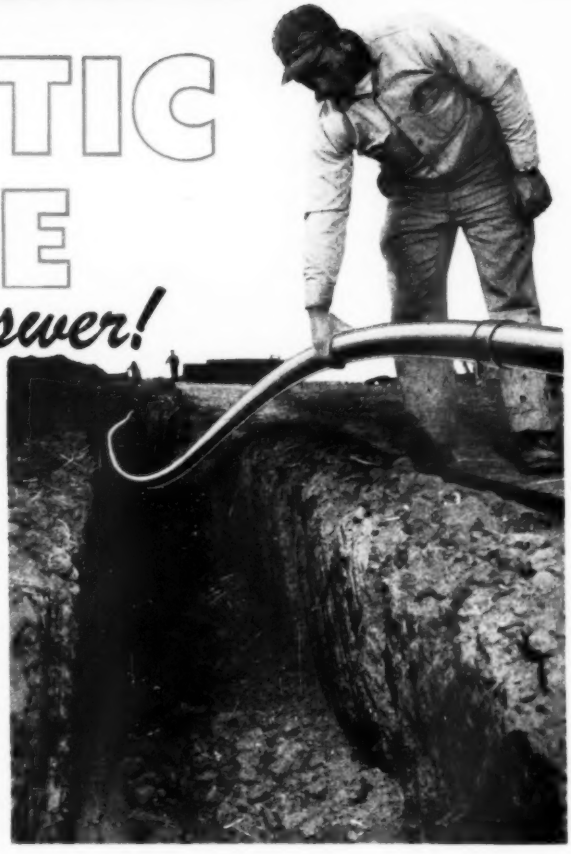
- Ability to travel where other trucks can't go.
- Greater safety — on or off the road.
- Ability to haul legal loads economically.
- Lower maintenance costs.
- Up to twice the truck life.

World-Wide Sales and Service

NEED *Fast Delivery* ON PIPE FOR

GATHERING LINES • GAS LINES • WATER LINES • DISPOSAL TUBING?

CARLON PLASTIC PIPE *is your answer!*



IMMEDIATE SHIPMENT

Immediate shipment from Wichita, Corsicana, and Cleveland.

RESISTS CORROSION

Chemically resistant to most alkalines, salts, acids, and hydro-carbons encountered in petroleum production.

ELIMINATES PARAFFIN BUILD-UP

Smooth internal surface helps prevent paraffin, asphalt and other semi-solids from adhering to internal sidewalls.

MOVES MORE FLUID AT LESS COST

Friction losses are held to a minimum because the smooth internal surface speeds up the flow.

PROVED IN THE FIELD FOR OVER 5 YEARS

Carlon Plastic Pipe has been proved for over five years, superior in many ways to ordinary steel pipe because of its resistance to paraffin and acid build up, corrosion and fluid friction. The easy handling and fast make-ups of Carlon Plastic Pipe save time and money on long or intricate connection assemblies.

We would like to give you the benefit of our five years' experience in plastic pipe applications to the oil and chemical industries. Our Engineering Service is readily available for consultation. Write, wire, or phone us, *no obligation*.

Pioneers in the application of Plastic Pipe to the Oil Industry problems

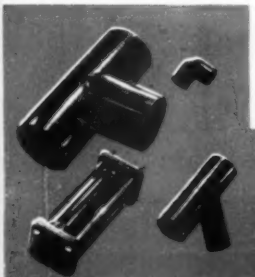
GREEN CONTRACTING & ENGINEERING CO.

IVAN KINDER
Webster 4769, Ft. Worth, Texas

J. K. MASSEY
6-9809, Odessa, Texas

J. D. KELLY
Underwood 6565, Houston, Texas

Carlon is the registered trade-mark of Carter Products Corp., Cleveland Ohio; Corsicana, Texas



COMPLETE STOCK OF STANDARD PLASTIC CONNECTIONS

CONNECTIONS FOR SPECIAL APPLICATIONS READILY AVAILABLE

hallicrafters

new, powerful 2-way FM radio-telephone!

the *littlefone*®

SERVES HUNDREDS OF OIL INDUSTRY'S VITAL NEEDS FOR DEPENDABLE, PORTABLE COMMUNICATIONS

HAND CARRY

HT-21 (25-50 Mc.)
HT-22 (150-174 Mc.)

- FULL TWO-WATT ANTENNA OUTPUT*
- Weighs only 14 pounds!
- Complete, self-contained 2-way radio-telephone station!
- Powered by Dry, or Wet Rechargeable Batteries (can be recharged from car battery or 117 Volts AC)
- Rugged, weatherproof
- 22 sub-miniature tubes!

*On 25-50 Mc. • One-Watt output on 150-174 Mc. 10-Pound, Lower Powered Models Also Available

CENTRAL STATION

HT-23 (25-50 Mc.) HT-24 (150-174 Mc.)

Same performance and specifications as the "Littlefone" Hand Carry.

- AC-operated Central Station
- Audio-amplifier, providing one watt of audio for loudspeaker
- Power consumption is 35 watts
- Plugs in any AC outlet (117 Volts)

Where one or more extra stationary receiving stations are desired, Hallicrafters economical S-81 receivers may be added.

A new, versatile, low-cost radiophone to serve all phases of Oil Industry communications. Scores of uses: between deployed units of geophysical crews, pipe line spreads, driller-toolpusher-contractor stores, mobile units in refineries, terminals and field processing plants.

USES OF "LITTLEFONE" CHALLENGE YOUR IMAGINATION!

There are literally thousands of industrial uses for the "*littlefone*" radio—anywhere where powerful, dependable, "on the move" contact is required.

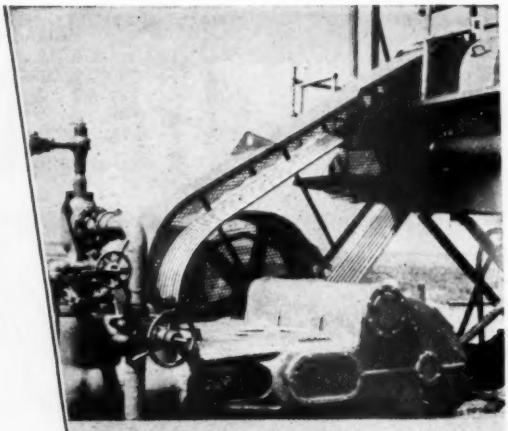
SAVES TIME AND MONEY IN SUCH OIL OPERATIONS AS:

- RIVER CROSSINGS
- FIRE FIGHTING
- COORDINATION AND DIRECTION OF MOBILE UNITS
- TANK GAUGING REPORTS
- PRODUCING LEASE REPORTS
- CASUALTY REPORTS
- EMERGENCY DRILLING
- EXPANDING RADIO NETWORKS
- PIPE LINE AIR PATROL (PLANE TO GROUND)
- OFF-SHORE DRILLING
- STANDBY EMERGENCY COMMUNICATIONS

hallicrafters
"The Radio Man's Radio"

World's Leading Manufacturer of *Precision* Radio and Television — Chicago 24

Prove for yourself why Gates Vulco Ropes are giving you longer V-Belt Wear!



The fastest well ever drilled in Scurry County, Texas—Texas Co. No. 154 P. L. Fuller—was completed by Parker Drilling Co. in 19 days, 8½ hours. Usual time required in this area is 30 days. Gates Vulco Ropes drove mud pump of the drilling rig.

There is a very simple reason why Gates Vulco Ropes—the V-belts built with *concave sides*—are giving you substantially *longer wear*—and you can easily prove this for yourself in just 2 minutes' time!

Pick up *any* V-belt whatever and bend it as it bends when going around a pulley. As the V-belt bends, grip its sides with your fingers—and here is what will happen, every time.

If the belt you are bending is a *straight-sided* V-belt, you can *feel* its sides *bulge out* as the belt bends. This out-bulge forces the sides of the belt to press *unevenly* against the V-pulley—as shown in figure 1-A (see accompanying diagrams).

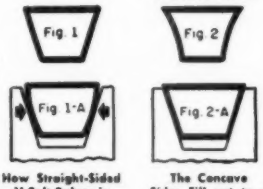
Clearly, this *uneven pressure* against the V-pulley causes the belt to wear *unevenly*—with the wear *concentrated* where the bulge is greatest—and this concentrated wear at one point naturally shortens the life of a *straight-sided* V-belt.

Now, make this same test with the belt that is built with Concave Sides—the Gates Vulco Rope!

Whereas you felt an *out-bulge* when you bent a belt with straight sides, you find that the *Concave Sides* merely fill out and become *perfectly straight*. The sides therefore *press evenly* against the V-Pulley. This distributes the wear *uniformly* across the *full width* of the belt. Naturally, this means longer belt life and *lower* belt costs for you!

Only V-Belts made by Gates are built with concave sides. Whenever you buy V-Belts, be sure that you get the V-Belt with the Concave Sides—The Gates Vulco Rope!

What Happens When a V-Belt Bends



How Straight-Sided V-Belt Bulges in Sheave -Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

The Concave Sides Fill out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

Gates® Hose V-Belts Molded Rubber Goods for industry

VULCO® ROPE DRIVES

ENGINEERING OFFICES AND JOBBER STOCKS IN ALL INDUSTRIAL CENTERS

CS-5110

THE GATES RUBBER COMPANY • DENVER • U•S•A

World's Largest Maker of V-Belts

Power transmission to off-shore wells with the help of...

"326" MONEL SHIELDED CABLE

Photo by Vachon, courtesy Standard Oil Company (New Jersey)

Here's the kind of cable that stands up under the severely corrosive conditions of off-shore operation... either carrying power to off-shore wells, or to bottom-hole equipment in these wells.

It's called "326"® Monel Shielded Cable.

"326" Monel—a *non-magnetic* high-Nickel alloy – has many characteristics that make it an excellent shielding material.

Like all INCO Nickel Alloys, "326" Monel is *rustproof* and highly resistant to a long list of commonly-met corrosives. Salt water and sour crudes, of course, are among them.

"326" Monel also possesses high physical properties—strength, toughness, and resistance to abrasion and mechanical damage. And it is readily brazed, soldered and welded.

Because of these characteristics "326" Monel Shielded Cable is a natural for applications where maintenance is not only costly but inconvenient.

And here's another important point. This cable is economical in price. It costs no more than other good metal-shielded cable. In some types, it actually costs *less*.

A number of well-known cable companies make "326" Monel Shielded Cable. ***But right now – with all metals in short supply because of the demands of the national rearmament and defense program – we can't promise how much will be available.***

But there are some things we *can* do. One of them is to be Johnny-on-the-spot when you run into problems involving metals for oil field use. INCO's Technical Service welcomes the opportunity to work with you. Write for their suggestions and recommendations. Naturally, this assistance is yours for the asking—no cost, no obligation involved.

EMBLEM OF SERVICE INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

the best gets better!

HALLIBURTON MEASURING DEVICES

Accurate, simple, and effective, Halliburton Measuring Devices eliminate much guesswork and miscalculation. Combined with Veeder Counter, all depths are read exactly. That's why oil operators the world over continue to use it for many purposes in addition to oil well cementing by Halliburton.

Now this long familiar group of instruments has some new and improved accessories—

1. *A new latch type Hay Pulley with aluminum frame and guard for keeping measuring line in sheave.*
2. *A measuring line wiper for use with the Hay Pulley for cleaning line when coming out of the open hole or drill stem.*

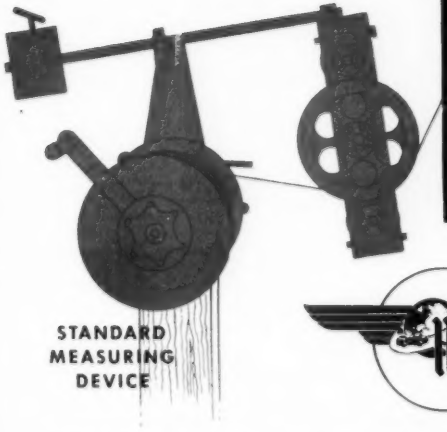
These two new units can easily prove an important key to maintaining the accuracy of the whole assembly! Keeping the measuring line clean and free of sand, mud, etc., will prevent undue wear on the sheave that actuates the Veeder counter. A heavy, gummy deposit on the measuring line itself will prevent accurate reading. For example, a decrease in the sheave groove diameter, or an increase in line diameter of only .01" can cause a short measurement of $3\frac{1}{4}$ feet in a 10,000 foot well.

The best gets better and promises an even greater accuracy now with Halliburton Measuring Devices. In any field, regardless of depth, Halliburton has a measuring device that meets all requirements – Standard, Heavy Duty, or Extra Heavy Duty. They are an essential part of your drilling equipment.

Get these new accessories now – phone your nearby Halliburton representative.

HALLIBURTON HEAVY DUTY

HALLIBURTON EXTRA HEAVY DUTY

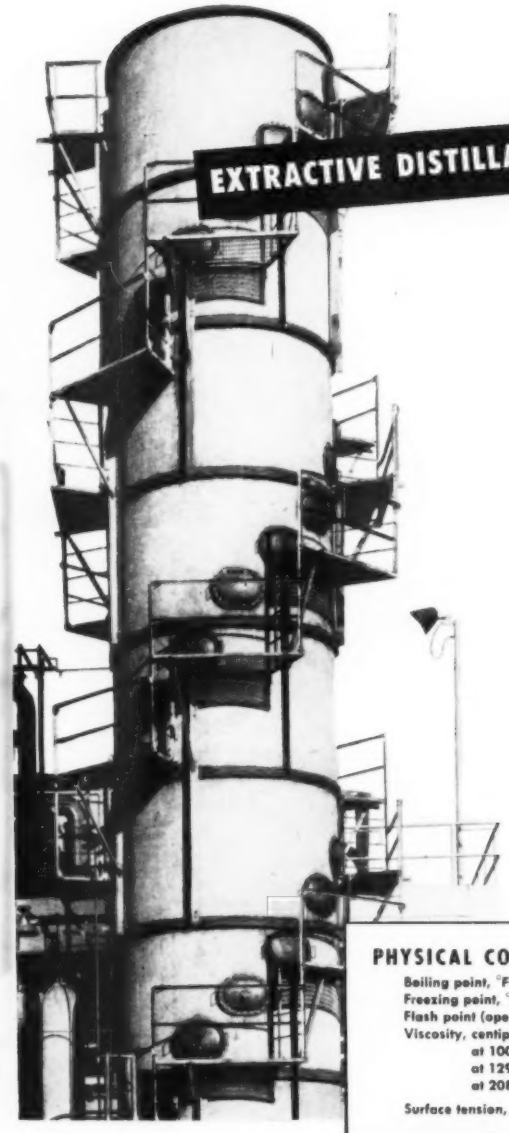


STANDARD MEASURING DEVICE

YEARS AHEAD IN MEASURING DEVICES!

HALLIBURTON

HALLIBURTON OIL WELL CEMENTING CO., DUNCAN, OKLAHOMA



EXTRACTIVE DISTILLATION CALLS FOR FURFURAL

Furfural has a long history of successful use in the purification of such high boiling materials as petroleum lubricating oils, wood rosin and vegetable oils by means of liquid-liquid extraction. Furfural has also been used successfully in separating lower boiling compounds by means of extractive distillation. For example, in the separation of C_4 hydrocarbons for the recovery of butadiene the addition of furfural alters the normal relative volatility of the several compounds in such a way as to make possible good separations with reasonable equipment size and low steam consumption.

Extractive distillation using furfural can be extended to include the recovery of benzene and other aromatics from petroleum fractions. Furfural has the desirable properties of good selectivity, high degree of thermal stability, ease of recovery, low freezing point, and relative non-toxicity. In addition, it is low in cost and is derived from raw materials which are replaceable yearly.

If you have a problem involving the separation of hydrocarbon mixtures, investigate furfural. Your inquiry is invited.

PHYSICAL CONSTANTS OF FURFURAL

Boiling point, °F.	323
Freezing point, °F.	−34
Flash point (open cup), °F.	134.2
Viscosity, centipoises	
at 100 °F.	1.35
at 129 °F.	1.09
at 208 °F.	0.68
Surface tension, at 20 °C, dynes/cm.	49

The Quaker Oats Company **CHEMICALS DEPT.**

3398 THE MERCHANDISE MART
CHICAGO 54, ILLINOIS
EASTERN SALES OFFICE:
ROOM 5398 120 WALL ST., NEW YORK 5, N. Y.

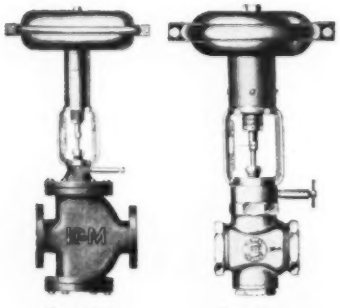
In San Francisco, The Griffin Chemical Company • In the United Kingdom, Imperial Chemical Industries Ltd., Billingham, England • In Australia, Swift & Company, Pty., Ltd., Sydney • In Europe, Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8e, France
In Japan, F. Kanematsu & Company, Ltd., Tokyo

Why Most Leading Companies Are Using K & M Control Valves

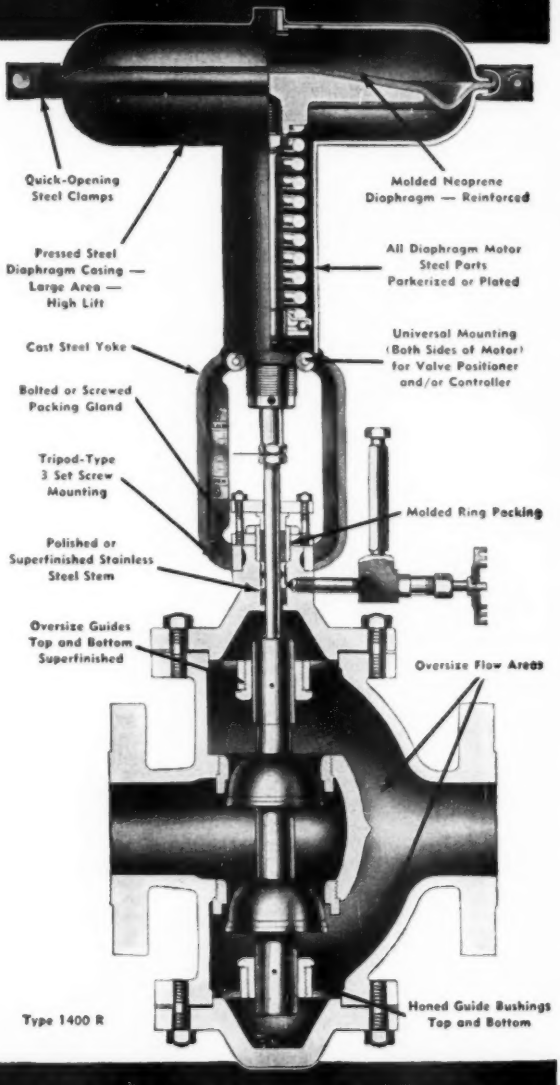
It is logical that leading companies should handle the important subject of control valves as they do other matters: They make use of the best available skills and thinking. More and more, they utilize the equipment, knowledge and facilities of the K & M engineering and service team.

Five years ago, K & M Advanced-Type Control Valves were new to industry. Today, with outstanding performance records behind them, K & M valves have become first in the regard of many instrument engineers. Increasingly, K & M representatives are called upon to give counsel and assistance in the planning of new control installations and the improvement of old ones. During the past year K & M men have been consulted on most of the projects in which control valves have been a major consideration.

There is a qualified K & M representative near you, eager to discuss your problems and able to help you with them.



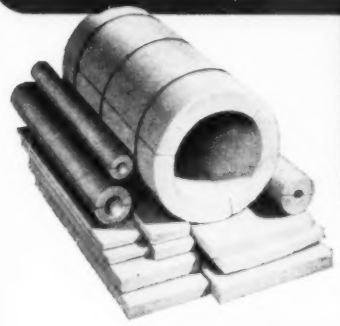
Type 1200 Type 1000



Type 1400 R

K&M KIELEY & MUELLER, INC.
Valve Makers Since 1879
2017—43rd STREET NORTH BERGEN, N. J.

Pattern for the Future...



MODERN CONSERVATION PROJECT—the new Snyder Gasoline Plant, Snyder, Texas, operated by Sunray Oil Corp. for some 30 companies and 60 individuals. Plant-process heating equipment and steam lines are insulated with Kaylo Heat Insulation. General contractor—The Fluor Corporation, Ltd., Los Angeles, Calif.; insulation contractor—Industrial Insulators, Inc., Houston, Texas.

Leading Refiners Are Switching to KAYLO HEAT INSULATION

The growing trend to Kaylo Heat Insulation is a logical result of the outstanding combination of advantages offered by this revolutionary heat-saving material.

Kaylo Heat Insulation, a hydrous calcium silicate, has high insulating value over a wide temperature range. It is *effective* up to 1200°F.—thus eliminating the need for combination coverings in nearly all operating conditions.

In addition, Kaylo Heat Insulation has these excellent physical characteristics: it is insoluble in water and incombustible. It has dimensional stability . . . high strength . . . light weight — properties vital to a superior heat insulation.

Its ease of handling, cutting and fitting simplifies application—saves time on the job. With these important extra advantages, *at no extra cost*, little wonder that leading refiners are switching to Kaylo Heat Insulation.

For complete details on Kaylo Heat Insulation, write Dept. N-230, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

SEE OUR CATALOG IN THE REFINERY CATALOG

KAYLO® ... *first in calcium silicate*

...*pioneered by* OWENS-ILLINOIS Glass Company

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Just part of the engineer's equipment

This formula, used in calculating mud weight increases, may not appear on the record but your Baroid engineer knows this formula (and countless others) by heart. With his experience and detailed knowledge of drilling and drilling muds, and the complete field laboratory built into the back of his car, he's ready at all times to speed to your rig and help you with your problems. There are no fees for his service, for it's a part of

Complete Drilling Mud Service

* X — number of 100-lb sacks of weighting material needed per 100 bbls. of mud.
Y — increase in mud volume due to weighting.
W_1 — initial mud weight (lbs./gal.)
W_2 — final mud weight (lbs./gal.)

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SETTLE YOUR *Treating Problems* WITH PARKERSBURG

● The most important step in settling emulsion treating problems is selecting the proper size and type of equipment. And the two most important factors controlling selection of the right treater are heating capacity required and quiet settling time allowed a given volume of oil.

Using this proven formula, Parkersburg offers 8 different types of treaters in a total of 32 sizes. From this wide range of emulsion treaters, Parkersburg can recommend exactly the treater required to meet the production characteristics of any given well. Ask your Parkersburg Representative about the size and type to meet your treating problem.

THE PARKERSBURG RIG & REEL COMPANY
Parkersburg, West Va.

No. 5119

PARKERSBURG
PRESSURE EQUIPMENT

HORIZONTAL AND VERTICAL SEPARATORS • HYRECO • HYDRACEPTER • SCRUBBERS • TREATERS • HEATERS
Manufactured in Houston, Texas

RESPIRATORY PROTECTION

•WITH **R31** CARTRIDGE — For low concentration of light organic vapors and gases in paint spraying, degreasing, dry cleaning, cementing, etc. Absorbs vapors of benzene, xylene, toluene, gasoline, naphtha, acetone, turpentine, etc.

•WITH **R32** CARTRIDGE — For low concentrations of acid gases, mists — sulphuric acid, hydrogen chloride, etc. Used in plating, pickling operations and similar.

•WITH **R15** CARTRIDGE — For nuisance and pneumoconiosis-producing dusts. (BM-2121)

•WITH **R33** CARTRIDGE — For low concentrations of combined acid and organic gases such as halogenated hydrocarbons, carbon tetrachloride, acetic acid. Protects in degreasing operations, etc.

•WITH **R16** CARTRIDGE — For toxic dusts not significantly more harmful than lead. (BM-2138)

•WITH **R34** CARTRIDGE—Protects against nuisance concentrations of ammonia.

•WITH **R17** CARTRIDGE—For all dusts not significantly more toxic than lead. (BM-2138)

1 FACE PIECE— 7 CARTRIDGES

(Quickly Interchangeable)

Protect against Dusts, Gases and Vapors

WITH THE AO R2000 RESPIRATOR

When a variety of hazardous vapors, gases or dusts are a problem, you can now simplify the protection and save money by standardizing on the AO R2000 Respirator. Its single, basic face piece accommodates four chemical cartridges of NON-SPARKING metal and three dust cartridges which, while light in weight for comfort, have maximum filtering capacity. CARTRIDGES INTERCHANGE WITH A TWIST OF THE WRIST—one twist removes outer cover, a second replaces it. Respirator may also be used with highly efficient, chemically-treated disposable dust filter.

QUICK RESPIRATOR FACTS

- Face mask molded from pliable rubber.
- ½" rubber headband.
- Inhalation valve of pure gum rubber freely admits air at lightest intake of breath, seals tightly on exhalation.
- Exhalation valve cannot stick, completely expels air—moisture cannot collect, dust cannot enter.
- Disassembly for cleaning is easy without special tools.

Your nearest AO Safety Products Representative can supply you

American Optical Company
SAFETY PRODUCTS DIVISION

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FAVORED POWER PLANT

...For Original Equipment
...For On-The-Job Applications

Operators specify Chrysler Industrial Engines because they are more dependable under extreme loads; offer smooth operating power, serve with less down time—are easily serviced.

Industrial Equipment users specify Chrysler Industrial Engines because they are longer lived, ruggedly built; and they can standardize their power needs with variations of the basic engine.

Agricultural users specify Chrysler Industrial Engines because they are economical, compact, powerful. They are engineered to take hard usage and weather without breakdown.

Construction people specify Chrysler Industrial Engines because they are high speed, high compression engines—operate pumps, generators, welders at high output, lower operating cost.

Your power needs are served better by dependable Chrysler Industrial Engines

Wherever there is need for a truly superior gasoline power plant, designers and operators alike *specify* Chrysler. For *this* high speed, high compression Industrial Engine is engineered specifically to your needs. Compact, clean design makes it easy to install, easier to service.

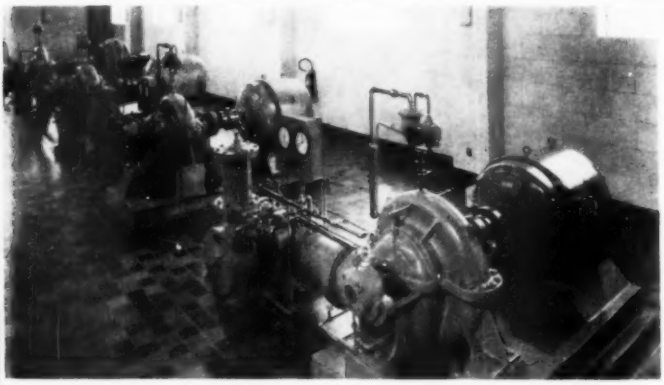
Feature after feature give the manufacturers and on-the-job operators performance records unequalled by other industrial engines. They operate day in, day out with little attention, practically no down time.

A trained staff of industrial power engineers at Chrysler travel the field constantly; finding ways to improve their product—helping solve unusual power problems.

When you have a power problem, see your Chrysler Industrial Engine Dealer or write: **Industrial Engine Division, Chrysler Corporation, Detroit 31, Michigan.**

CHRYSLER
Industrial Engines and Power Units

HORSEPOWER WITH A PEDIGREE



A Plan That Gets the Most out of Centrifugal Pumps

Easy-To-Install Maintenance Program Means Better Performance, Longer Life

You can't get maximum production when your equipment's operation is constantly interrupted due to breakdowns. Moreover, today's equipment shortages make it increasingly more important that you get all the life you can out of your present machines.

We'd like to suggest a maintenance plan that will help you get the most out of one of your most vital pieces of equipment—centrifugal pumps.

Keep Informative Records

If you haven't already done so, it's a good idea to begin your maintenance plan by setting up a card index file so that you can catalogue each pump in your plant. Each card should contain the following information: plant pump number, size, manufacturer's name and style, serial number, date installed, and any other data which will help you to rapidly locate repair parts lists and manufacturer's parts numbers.

The rest of the card can be divided into a number of columns: Repair Date, Part Affected, Remarks, and Cost. A typical card is shown here.

PUMP MAINTENANCE CARD

_____ PUMP NO.	_____ MANUFACTURER
_____ SIZE	_____ MFGR'S ADDRESS
_____ DATE INSTALLED	_____ MFGR'S SERIAL NO.
_____ LOCATION	_____ MFGR'S STYLE

DATE	PART	REMARKS	COST

If you're careful to enter every maintenance or repair operation on the proper card, it won't be long before each card indicates a particular pattern of maintenance.

Set Up A Maintenance Schedule

Once this pattern is established for all the cards, you can set up a schedule of maintenance points for such items as: packing, greasing or oiling, painting, gasket replacement, and bearing examination. You may find, for example, that a unit or group requires packing maintenance about once every three months, and greasing once every four to six months, etc.

Your next step is to arrange a plant schedule so that a particular pump may be shut down for maintenance at or before these times. Thus you make it possible to do the maintenance work under proper and unhurried conditions to assure maximum conformity of production consistent with long pump life. In addition, examination of the card catalogue will guide operating and maintenance personnel as to quantity of repair parts they should keep on hand.

Make Periodic Inspections Externally

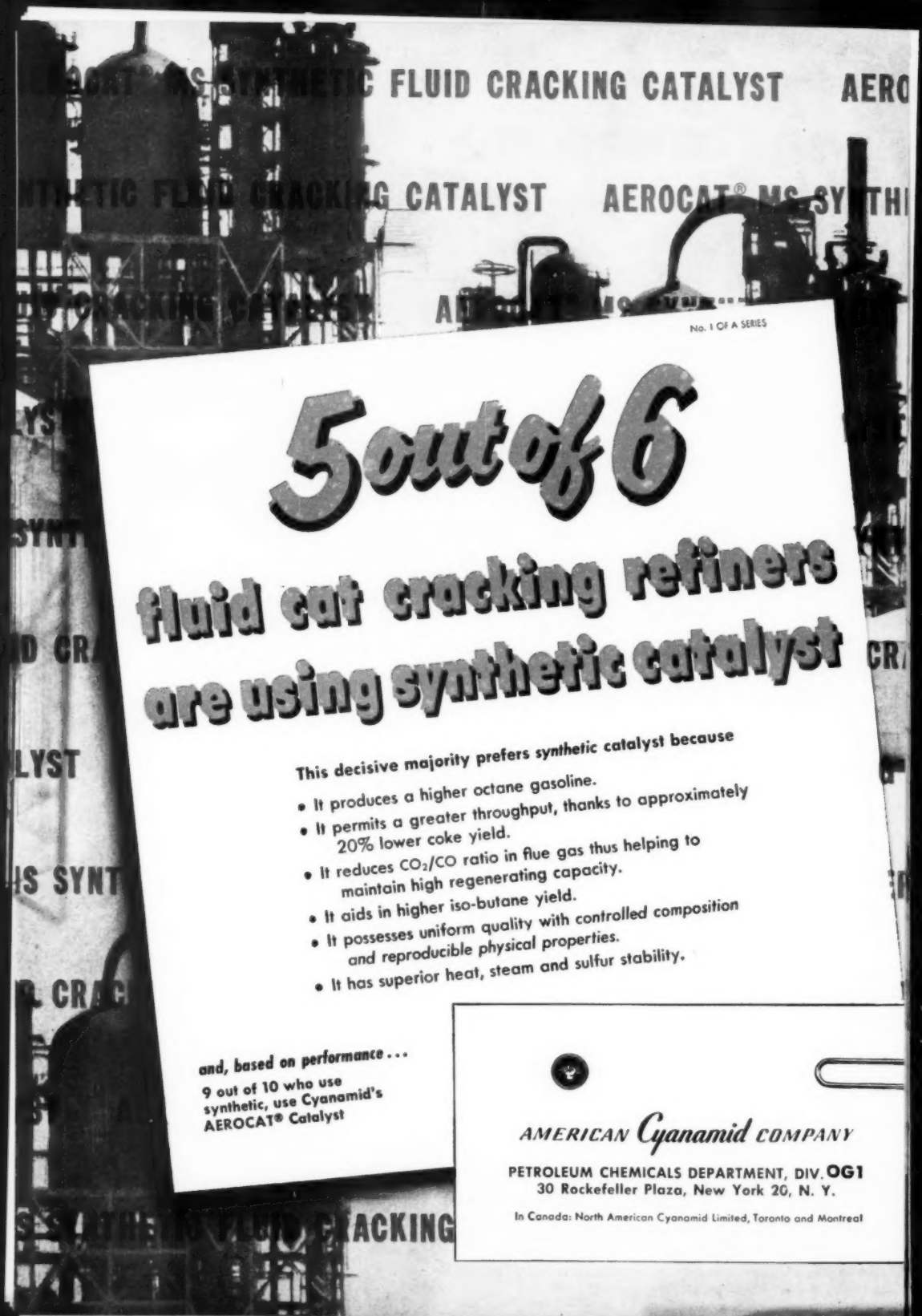
It is considered *inadvisable* to open pumps for inspection.

Rather, recent practice is to let pumps stay on the line until such time as external symptoms indicate overhaul may be required. These symptoms involve either a reduction in effective capacity because of wear at the internal clearance points or mechanical difficulties, such as vibration or noisy operation.

Parts requiring most frequent replacement in centrifugal pumps are: wearing rings, shaft sleeves, packing and bearings.

The most important maintenance point on process pumping equipment is the stuffing box. It must be kept clean, cool, and lubricated—but *packing* is the crucial operation. A good packing method will be discussed in a later edition of *Pointers on Pumps*.

Don't forget the frames, base plates, and supporting parts of your pumps. Good housekeeping often makes it easier to do a good overall maintenance job!


FLUID CRACKING CATALYST
AEROCAT® MS SYNTHETIC FLUID CRACKING CATALYST
No. 1 OF A SERIES
5 out of 6
fluid cat cracking refiners
are using synthetic catalyst
This decisive majority prefers synthetic catalyst because
• It produces a higher octane gasoline.
• It permits a greater throughput, thanks to approximately 20% lower coke yield.
• It reduces CO_2/CO ratio in flue gas thus helping to maintain high regenerating capacity.
• It aids in higher iso-butane yield.
• It possesses uniform quality with controlled composition and reproducible physical properties.
• It has superior heat, steam and sulfur stability.
and, based on performance...
9 out of 10 who use synthetic, use Cyanamid's AEROCAT® Catalyst
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SPECIALIZATION **GIVES YOU UNIFORM HIGH QUALITY IN**

GLOBE ALLOY STEEL TUBES

When you specify GLOBE you get the finest, because Globe *specializes* in the production of steel tubes. For more than thirty years Globe *specialized* research, engineering and manufacturing facilities have assured customers of uniform high quality in alloy steel tubes for pressure or mechanical applications.

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Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globeiron (high purity ingot iron) seamless tubes — Globe Welding Fittings.

TYPICAL ANALYSES:

Carbon Moly.
1-¼ Chrome ½ Moly • 1-¾ Chrome ¾ Moly
2 Chrome ½ Moly • 2-¼ Chrome 1 Moly
5 Chrome ½ Moly • 7 Chrome ½ Moly
9 Chrome 1 Moly
AISI 1335 • AISI 2317 • AISI 2512 •
AISI 4130, 4140 • AISI 4615 • AISI 8615,
8620, 8630, 8635, 8640 • 7% Ni. • 9% Ni.

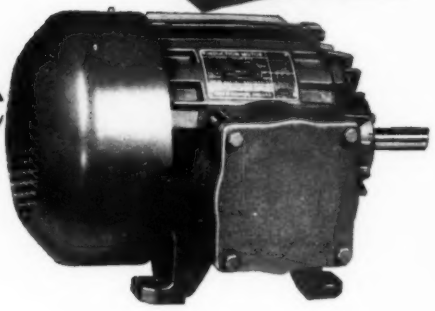
TYPICAL APPLICATIONS

Pressure Tubes — Superheater Tubes — Condenser Tubes — Still Tubes — Evaporator Tubes — Barrel Tubes — Oil-Well Pump Barrels — Mechanical Tubes — Aircraft Tubes—Rollers for Transmission Chains

GLOBE SEAMLESS TUBES FOR MAXIMUM STRENGTH AND MINIMUM WEIGHT

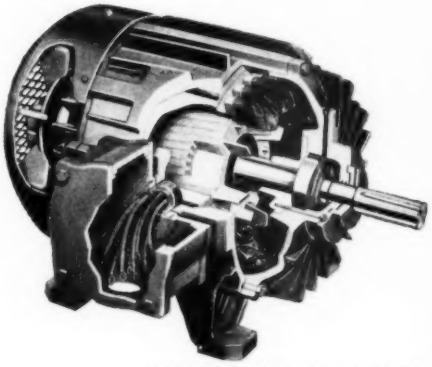
Pierced from solid steel billets . . . with no seams or welds. Globe seamless tubes are available in many sizes and wall thicknesses for exacting applications.

Look Outside



Greatly increased radiating area means greater cooling efficiency. More important, cooling efficiency stays high. There are no enclosed external air passages to clog and cause overheating. If oily dirt sticks, just wipe or blow it off. No matter how bad operating conditions are, this motor can easily be kept clean and cool-running. Electrical parts are protected against corrosive atmospheres by cast iron yokes and end housings.

Look Inside



Double-shielded, heavy-duty ball bearings require no maintenance in ordinary service under most conditions. However, they can be lubricated without disassembly if required. Double shielding prevents over-lubrication, leading cause of bearing trouble. Rotating seals, where shaft extends through housings, keep dirt and moisture out of bearing chambers. Deep rabbet fits between frame and end shield; heavy ribbing and long flame seals on shaft more than meet Underwriters' label requirements for Class I, Group D and Class II, Groups F and G locations.

See WHY THIS IS YOUR BEST MOTOR BUY

HERE IS AN EXPLOSION-PROOF MOTOR that is different from conventional explosion-proof motors; built with an entirely different cooling system that gives you big savings in lower maintenance costs, more continuous service and less trouble in toughest locations. Clogging can easily be prevented in the Allis-Chalmers Type APZZ explosion-proof motor since areas that might collect dirt are exposed and easy to clean. And, of course, it's ideal for outdoor installations.

GET DETAILS NOW — *Ask your nearby Allis-Chalmers Authorized Distributor or District Office for more complete information on this high performance explosion-proof motor. Or write direct to Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7286.*

A-3579

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

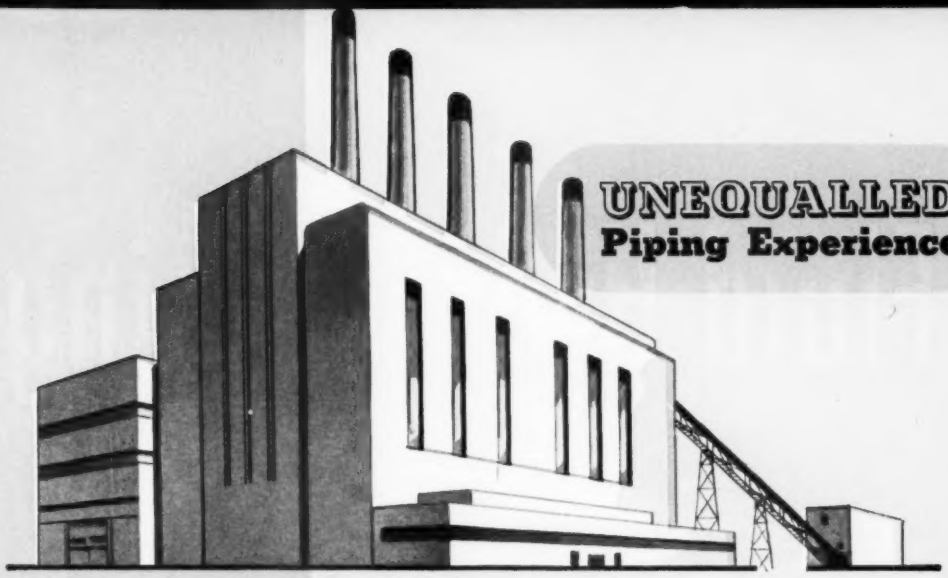
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS



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Since 1945, Piping for More than

5,580,000 kw

of Central Station Capacity
scattered from Wicasset, Maine to Hawaii
from Grand Forks, North Dakota to Brownsville, Texas

has been fabricated and erected* by

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4 Plants Are Better Than 1

*Including Projects Now Under Construction or on Contract

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ANNOUNCEMENT

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are authorized to design and construct Fluid Hydroforming Units. This process employs the "fluid" principle so widely and successfully used in Catalytic Cracking to obtain a high yield of high-octane gasoline with low first cost.

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Mountain-climbing pipe line being laid for keeps!

IT'S PROTECTED BY BITUMASTIC ENAMEL!

THE 26-INCH natural gas pipe line, shown here, was laid across the most mountainous part of West Virginia for the Atlantic Seaboard Corporation. Here's a sample of what the pipe liners were up against: at one point the face of Cave Mountain rose at an average rate of 45 degrees, climbing for 1,700 feet before easing off to a more gradual slope.

When pipe lines are laid under such back-breaking conditions, they *must* go down to stay . . . they *must* be fully protected against corrosion. That's why this pipe line was coated with Bitumastic® 70-B Enamel.

Bitumastic® Enamels have established remarkable records in preventing corrosion — under the most severe corrosive conditions . . . in all types of soil . . . under wide variations of temperature. Thanks to these durable enamels, many gas and oil pipe lines, laid 20 and 30 years ago, are still giving good service today.

Specify Bitumastic Enamels and make certain *your* pipe-line projects get the most effective protection against corrosion. Your Koppers representative will give you complete details and estimates.

Bitumastic Enamels soon available from Koppers new California Plant!

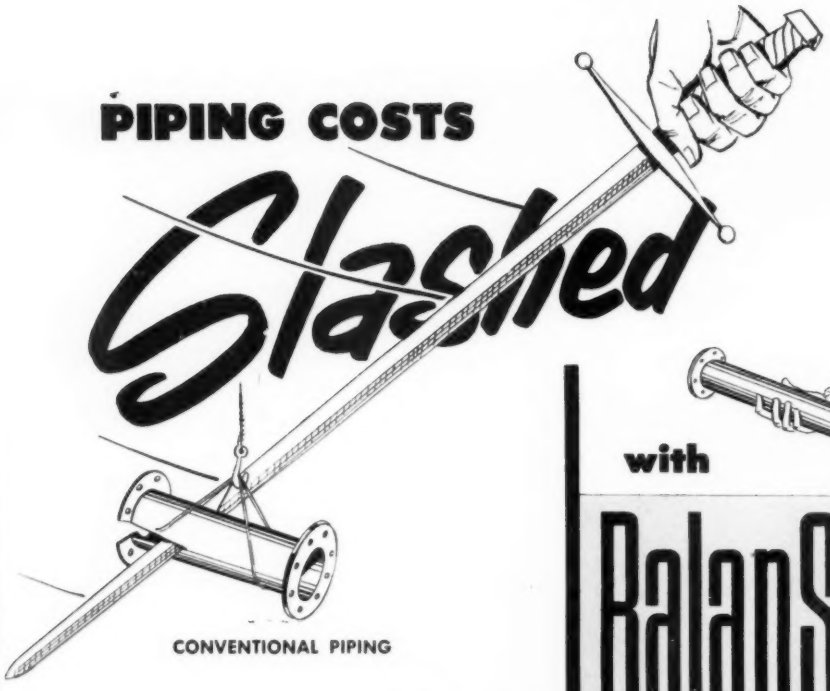
As soon as present construction work is completed, Koppers will be able to supply Bitumastic Enamels from a new plant at Fontana, California. The plant is being built to give you better service in the West.

KOPPERS BITUMASTIC ENAMELS
REG. U.S. PAT. OFF.

KOPPERS COMPANY, INC., Tar Products Division, Dept. 103T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH AND WOODWARD, ALABAMA

PIPING COSTS Slashed



CONVENTIONAL PIPING

with

BalanSeal®

TYPE

FarriSeal

SAFETY VALVE

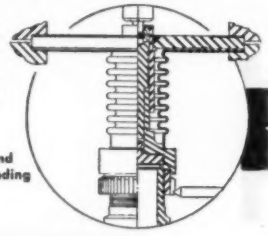
If your safety or relief valves discharge into a collecting header, you can effect substantial reduction in discharge piping cost by specifying BalanSeal Safety Relief Valves... economies that amount in some instances to *15 times as much as the cost of the valves themselves.*

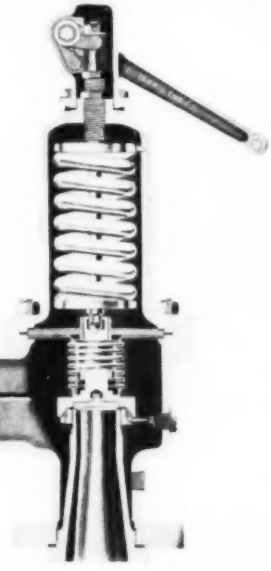
HERE'S HOW: Because BalanSeal Safety-Relief Valves balance out the effects of discharge pressure surges, you can use much smaller discharge piping... can depend on your valves to operate at the set pressure regardless of how high the back pressure may be.

Besides this big economy feature of a BalanSeal installation, you get what you *must* expect of any really *safe* safety-valve—*positive protection* at all times and under all conditions of operation.

HERE'S WHY: The FarriSeal bellows seals off the stem, guide, and spring... protects them from corrosive action of the lading fluid... prevents freezing of the moving parts. Proper proportioning of the bellows diameter nullifies the effect of back pressure on the relieving point... the *only* force opposing the lifting of the disc is the spring pressure. Finally, the long, 2½ to 1 guiding ratio of the stem in the guide assures smooth action without cramping.

You can't afford to overlook the advantages of BalanSeal—for Savings and Safety. Get your copy of MANIFOLD DISCHARGE PIPING APPLICATION—Manual 51-B—a valuable reference work on this subject.





*Patented and Patents Pending

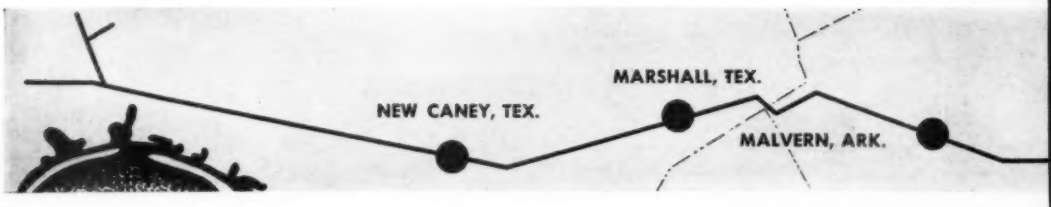
Farris

SAFETY and RELIEF VALVES

FARRIS ENGINEERING CORP.

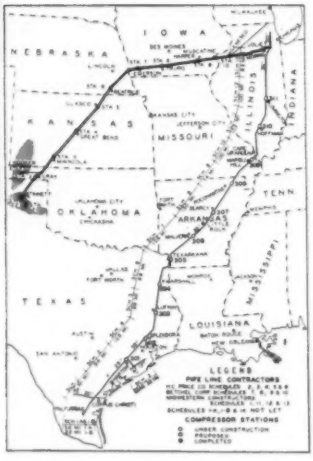
Commercial Avenue Palisades Park, N. J.

1089



Texas-Illinois Compressors 100% Worthington

25 2000-horsepower engine compressors used in 5 stations on 1400-mile line



THE ORIGINAL GAS PIPELINE TO CHICAGO, built by the Natural Gas Pipeline Company of America in 1931 from the Texas Panhandle field to Joliet, Illinois, used 57 Worthington 1400-hp gas-engine compressors—all that were installed at that time. (Upper line on map.) Since 1931, 48 units were added; today a total of 105 units are operating on the line.

On Dec. 5, 1951, the valve turn-on ceremonies at Joliet, Illinois, initiated the flow of additional Texas gas to the Chicago Area.

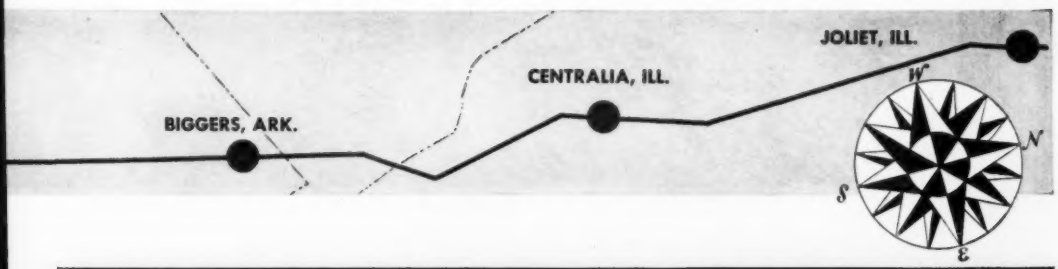
Along the new line—which will deliver 374,000,000 cu ft of gas daily—are twenty-five 2000-hp Worthington gas-engine compressors working in groups of five at stations from New Caney, Texas to Centralia, Illinois.

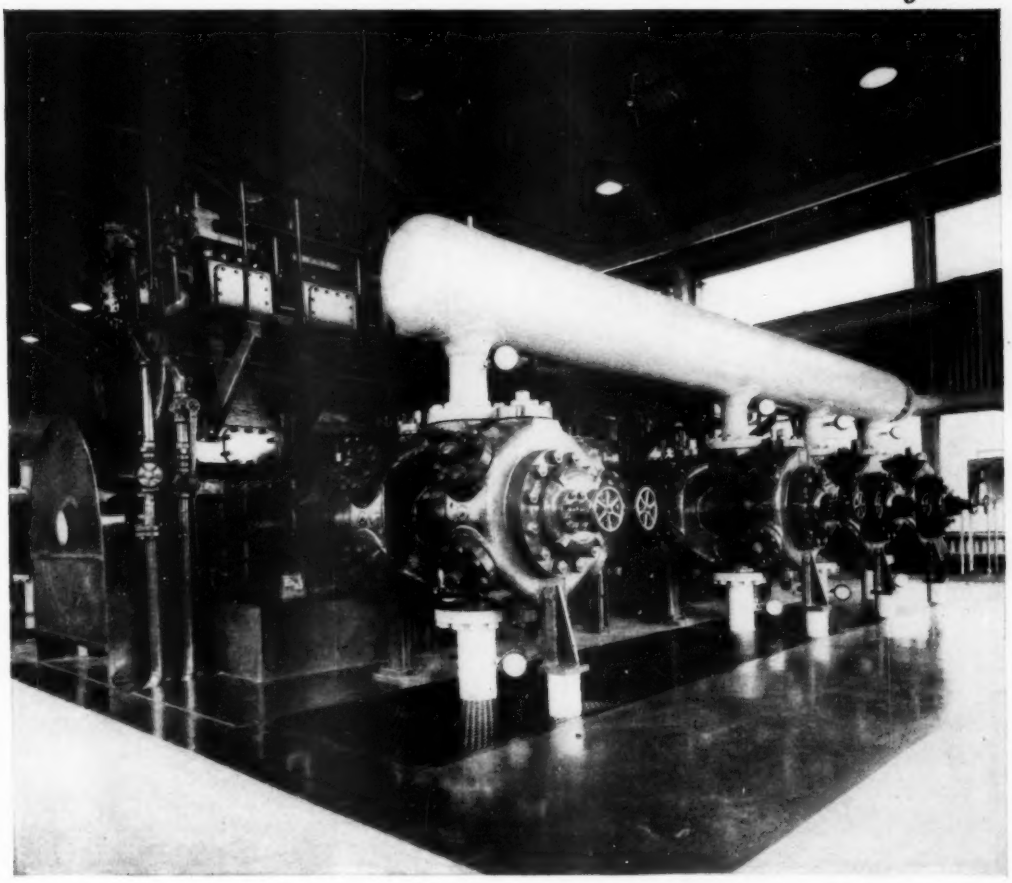
The 10-cylinder UTC-16 gas engines use Worthington's uniflo timed-scavenging method that assures a "clean-sweep" of burned gases and the smoother operation that goes with it.

Though designed primarily as a pipeline gas-engine compressor, the UTC-16 is suitable for many services including: pressure maintenance on oil wells . . . in natural gasoline plants . . . in oil refineries for solvent extraction, vapor recovery, recycling and stabilization of gases . . . in petro-chemical processing of products made from natural gas under pressure . . . and in many refrigeration applications.

The uniflo UTC-16 is built in sizes from 1000 to 2000 hp. If your process requires gas compression and you have a suitable gas available for fuel, the Worthington UTC-16 will do a better job for you. For complete information contact your nearest Worthington District Office or write Worthington Pump and Machinery Corporation, Engine Sales Division, Buffalo, N. Y.

NO OTHER COMPRESSOR WILL





WORTHINGTON 2000-hp 10-CYLINDER ENGINE-COMPRESSORS at New Caney, Texas, station of the new Gulf Coast-Chicago pipeline of the Texas-Illinois Natural Gas Pipeline Company. These engines use Worthington's uniflo thru-scavenging system—a design thoroughly proved by years of research by Worthington.


PORTABLE COMPRESSORS


RADIAL


GAS ENGINE COMPRESSORS

OUTPERFORM A WORTHINGTON

WORTHINGTON

Engine Compressors

EK.2.1

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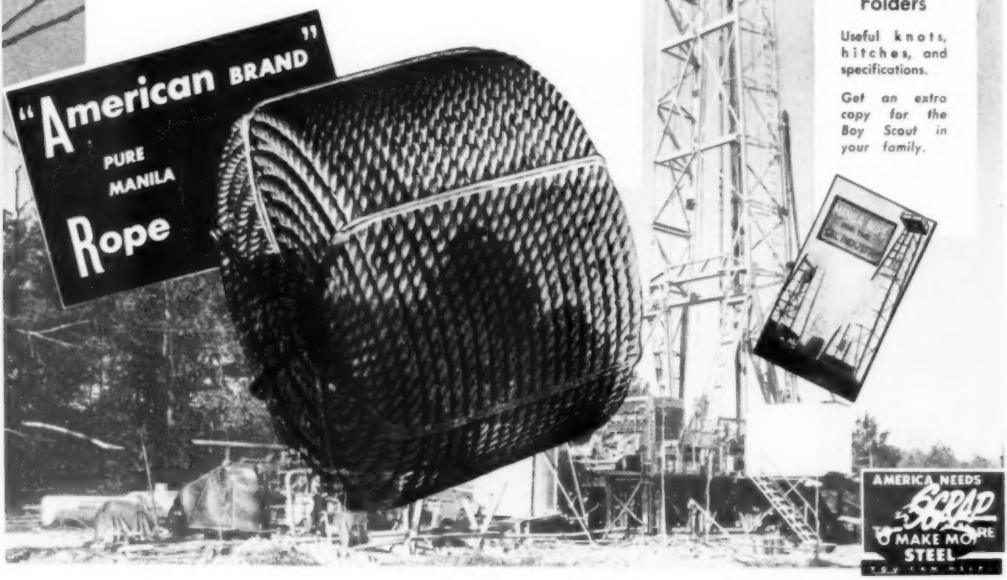
Catlines . . . Spinning Lines . . . Derrick Lines . . . Bull Ropes . . . "TROJAN" Best Pure Manila Drilling Cables and Crackers . . . Rope for Refinery Maintenance.



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Useful knots, hitches, and specifications.

Get an extra copy for the Boy Scout in your family.

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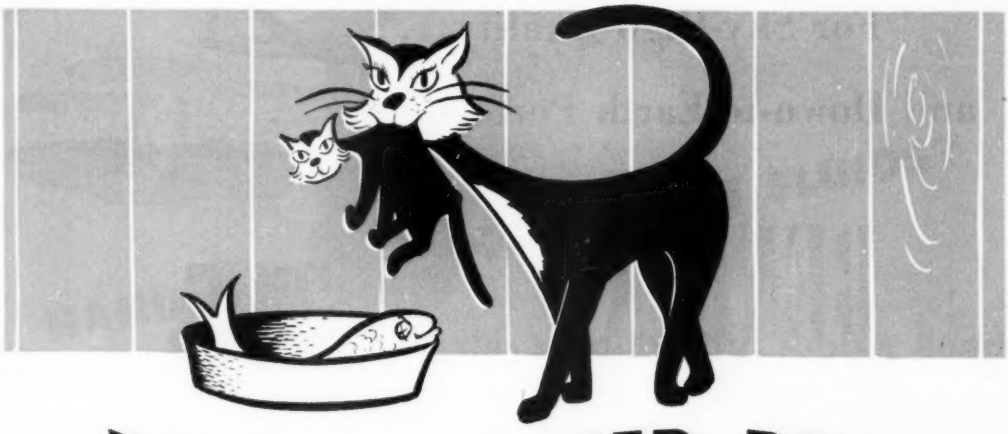
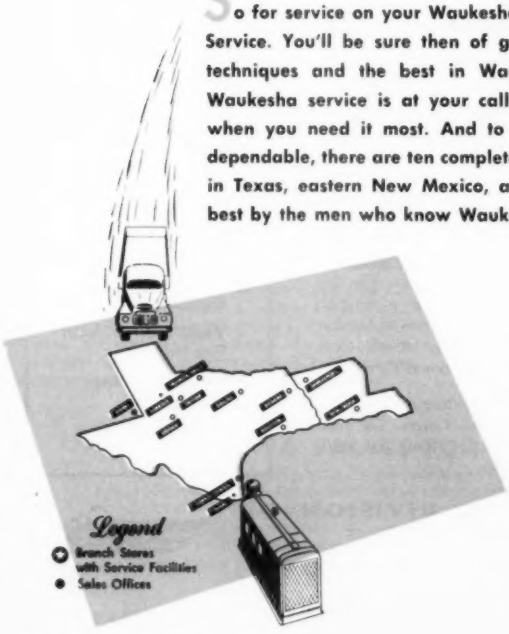
Subsidiary of Jones & Laughlin Steel Corporation



YOU'RE TREATED BEST AT HOME

YOUR *Waukesha* ENGINE IS TREATED BEST AT HOME, TOO

So for service on your Waukesha Engine call Waukesha Sales and Service. You'll be sure then of getting the latest in factory-service techniques and the best in Waukesha factory-trained mechanics. Waukesha service is at your call twenty-four hours a day to help when you need it most. And to make Waukesha service fast and dependable, there are ten complete service shops strategically located in Texas, eastern New Mexico, and Louisiana. You will be treated best by the men who know Waukesha best.



WAUKESHA

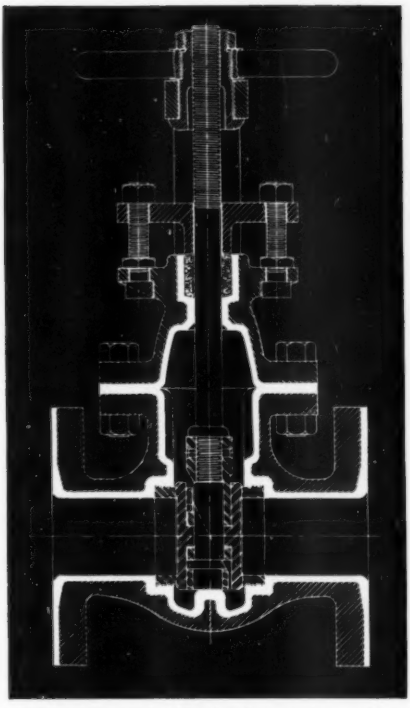
SALES & SERVICE, INC.

1422 MAURY STREET • HOUSTON, TEXAS

EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, LOUISIANA AND EASTERN NEW MEXICO

HANDLING CORROSIVE FLUIDS?

this unique hard rubber lined iron body gate valve offers big savings in many corrosive services . . .



Darling 150-pound rubber lined gate valve, with outside screw and yoke, featuring unique parallel seat, fully revolving disc principle. Plain "no pocket" discs prevent accumulation of sediment. Darling rubber lined gate valves can be furnished only in rising stem, cylinder or motor operated; or quick-opening types.

WHEN Darling gate valves of this type go to work, you gain *multiple* advantages sure to save you money *and* time.

First, you gain big initial savings because these rubber lined iron body gate valves (ideal for many corrosive services not exceeding 180° F.) are much less expensive than special alloy valves. Moreover, Darling's special bonding technique permanently prevents separation of the hard rubber lining from the valve body.

All interior working parts are made of alloys suitable for the corrosive conditions encountered.

Secondly, and equally attractive, is Darling's exclusive *fully revolving double disc, parallel seat* feature! In a nutshell this means drop-tight closure where most other valves would fail. It also assures unmatched life with a very minimum of attention and maintenance.

Here's a combination you just can't beat! Before you buy gate valves of *any* type, get acquainted with these unique Darling valves and their operating details. Get *all* the facts.

Write today for free bulletin describing Darling rubber lined gate and check valves.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

DARLING VALVES FOR EVERY NEED

Darling parallel seat revolving disc gate valves are available in a wide range of sizes and constructions for all kinds of normal and unusual service, and for pressures up to 1500 pounds. In addition to rubber lined, iron body valves, corrosion resistant types include plain iron body with special alloy trim, cast steel, all bronze, special alloys or combinations as required. We'll gladly furnish specific recommendations on the proper valves for your particular service.

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

Sound, Dependable Pipe for Distribution Lines

For economical operation of a distribution line, you need pipe that can take it—pipe that is sound and dependable.

Bethlehem Oil and Gas Pipe is ideal for distribution lines because it can be made to any of these specifications: API 5Lx42, ASTM A-139, or ASTM A-134. It is turned out on up-to-date equipment. It is a high-quality pipe in every way, and is easy to weld.

WIDE SIZE RANGE—Bethlehem Oil and Gas Pipe comes in 40-ft lengths. It can be furnished with beveled or straight ends. It comes in diameters from 22 in. i.d. up to the largest permitted by common carriers.

COMPLETE MANUFACTURING FACILITIES—In diameters up to 36 in., Bethlehem Oil and Gas Pipe is made with one longitudinal and one girth seam. Larger sizes have two longitudinal seams. Our shop is equipped for grit-blasting, priming, enameling and wrapping, and has facilities for the manufacture of tees, crosses, and related fittings.

We'll be glad to talk with you about pipe for distribution lines. Write or call the nearest Bethlehem sales office.

PIPE OF MAYARI R RESISTS SHOCK LOADINGS CAUSED BY VIBRATION

Pipe made of Mayari R, Bethlehem's low-alloy, high-strength steel, successfully withstands pipeline shock loadings caused by vibration at or close to compressor stations. This is made possible because of the excellent fatigue properties of Mayari R (endurance limit 50,000 psi), and its high yield point (50,000 psi min).

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM OIL AND GAS PIPE

Cummins® Diesels do so many jobs... so much better

...because they're custom-built to fit the job!

On-highway trucks, buses

Industrial locomotives, cranes, shovels

Logging yarders and loaders, crawler tractors

Drilling rigs, centrifugal pumps, generator sets

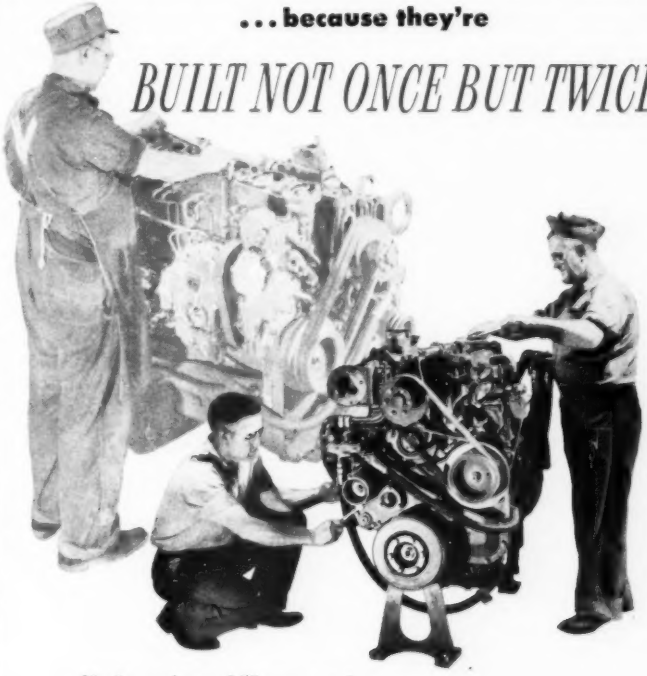
Earthmovers, off-highway trucks

Work boats, pleasure craft

Lightweight, high-speed Diesels (50-550 hp) for these and many other uses

...because they're

BUILT NOT ONCE BUT TWICE



Need rugged power? Then you need lightweight, high-speed Cummins Diesels, custom-built to fit your needs. Each engine is built *twice*. It's assembled, run-in tested, disassembled and inspected, then reassembled and tested again. Consider Cummins' craftsmanship; the exclusive Cummins fuel system; our efficient and expanding parts and service organization. These all add up to minimum "down-time", more power and profit for the user. See your Cummins Dealer.

Diesel power by CUMMINS

CUMMINS Dependable DIESEL

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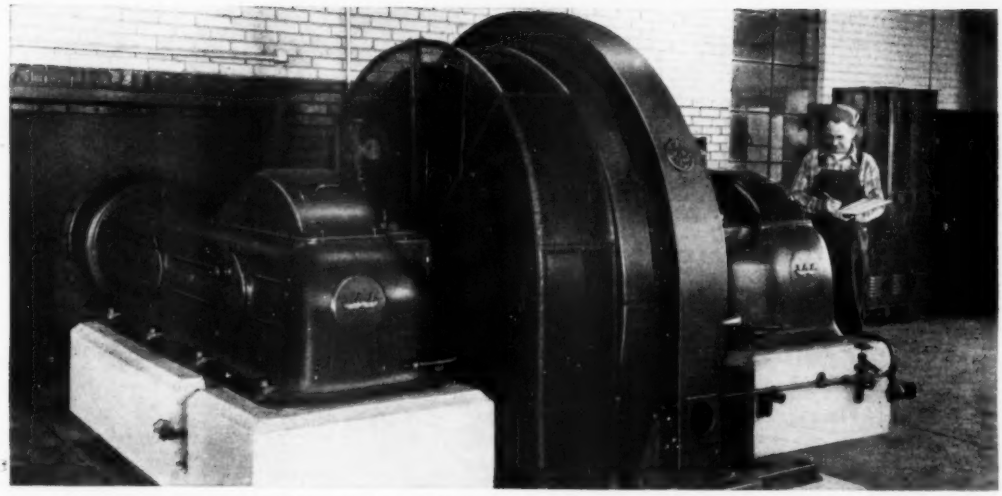
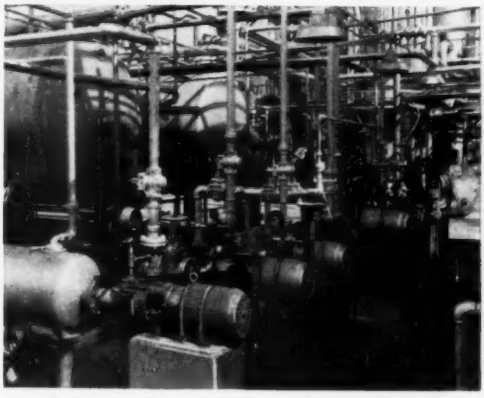


Proved dependability and minimum maintenance make G-E synchronous motors a top refinery choice. This G-E 400-hp 4160-volt synchronous motor drives two gas compressors in the fluid catalytic cracker.

Corrosion and weathering doesn't harm G-E totally-enclosed explosion-proof motors. At Rock Island, the two G-E 40-hp motors of this type in foreground drive crude charge pumps, while the two G-E 15-hp vertical motors of the same type in background drive pumps charging partially refined oil directly to the cracking unit.



Five of a kind—all G-E, all totally-enclosed explosion-proof—these motors vary in rating from 2 to 20 hp. They are used to "charge" gasoline and burning oils to Rock Island's treating plant, where objectionable odors and sulphur compounds are removed or transformed.

New G-E Motor Selection and Application Course *can help train your refinery employees, increase their efficiency. A G-E "More Power to America" program, it shows how motors work, types now in use, how to select and apply them for specific jobs. Write now for Bulletin GEA-4938-16 describing the course in detail.*

Co-ordinated

ELECTRIC EQUIPMENT

for fluid catalytic cracking

They Say—

Why We Have Oil

"Twenty to thirty years ago prophets of doom were forecasting that the nation would run out of oil in almost no time. Since then, consumption of oil has increased to almost unbelievable levels. Yet, instead of running out of reserves, we actually have larger known reserves of oil than ever before.

"Finding oil is an extremely risky and expensive process. . . . People spend their time and money and energies on such ventures for only one reason—because they know that, if they are successful, they will earn a profit. That consideration, and that consideration alone, makes the risk worth while.

"Yet, we have in government today a dangerous element which would destroy the very incentive that has been the backbone of our economic structure. . . . These radicals can attack and debase the profit motive all they wish—but it is the engine which makes this and every other progressive country drive ahead. We must be on guard continually against the devious means being used by the socialist planners to destroy the motive which provides the life blood of our great system of free, competitive enterprise."

Editorial in the Oil City Derrick

Competition in Research

"Cooperative research suffers from the absence of an incentive to make a profit, to get ahead in the competitive struggle. It also abandons the proved advantages of many independent centers of initiative and different methods of attack on difficult problems.

"Given a fair chance, research can contribute far more than it already has to enrich and lengthen human life."

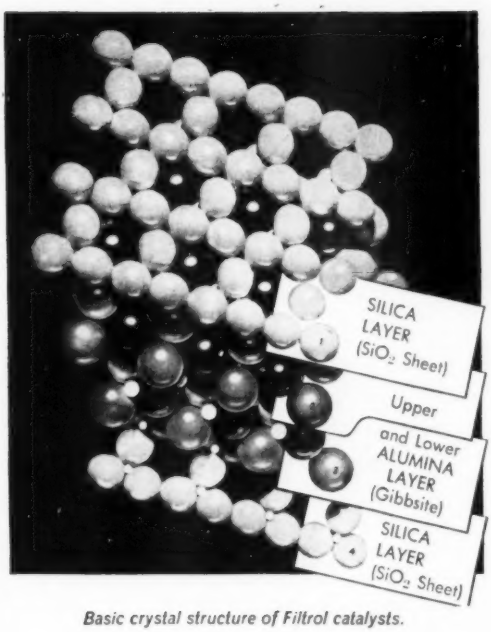
Dr. Robert E. Wilson, chairman of Standard Oil Co. (Ind.), addressing American Association for the Advancement of Science, Philadelphia.

Another Definition

"Depletion to an oil well or mine is simply what depreciation is to farm machinery or business buildings. But as provided in the tax laws, oil or gas well owners may deduct 27½ per cent of gross income from each property or one-half net income, whichever is smaller, so long as the property is in operation.

"Thus, an oil operator may recover the cost of his investment even a hundred-fold through depletion allowances.

"In 1947, says the Treasury De-



Basic crystal structure of Filtrol catalysts.

Cracking Catalyst Uniformity

NOT THE FRESH BUT THE EQUILIBRIUM CATALYST DOES THE CRACKING AND DETERMINES THE YIELDS AND DISTRIBUTION OF CRACKING PRODUCTS.

ACCUMULATED EXPERIENCE AND DATA SHOW THAT YEAR IN AND YEAR OUT THE STABLE CRYSTAL STRUCTURE AND SIZES OF FILTROL CATALYSTS GIVE UNIFORM DEPENDABLE EQUILIBRIUM CATALYSTS.

OTHER REASONS FOR USING FILTROL CATALYSTS

1. *HIGHER OCTANE BARRELS*
2. *HIGH BUTYLENE YIELD*
3. *LOW COST*
4. *SULPHUR RESISTANT CATALYSTS*
5. *FASTER REGENERATION RATE*
6. *VARIED PLANT FACILITIES*
7. *TECHNICAL SERVICE*
8. *LOWERED EXCESS BUTANE*
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CATALYSTS AND ADSORBENTS

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TOP PERFORMANCE AT ROCK BOTTOM COST

WITH THE GUIBERSON

TYPE "B" TUBING SPIDER

Stock sizes 1" to 3"; spiders are available on special order for 2" x 1" and 2½" x 1¼" parallel strings.

BETTER BE SAFE THAN SORRY GUIBERSON

REG. U.S. PAT. OFF.

The Guiberson Type "B" tubing spider is a fast-handling, light-weight tool that can be handled by one man if necessary — and the cost of the "B" is light-weight, too. No other spider in its class offers greater economy, either initially or in the long run.

Despite its exceptionally light weight, the Type "B" spider will hold the longest string, and release instantly without sticking when you pick up. All slips fit the same bowl, and the "B" will not distort or damage tubing. Self-equalizing slips with hard, sharp teeth, give full, large-area contact, assuring positive grip, better load distribution and perfect release.

For positive performance, maximum protection, amazing handling ease and surprisingly low cost, you can count on the sure-grip "B" Tubing Spider.

SOLD BY LEADING OIL FIELD SUPPLY STORES EVERYWHERE

Established 1919 — THE GUIBERSON CORPORATION — Dallas, Texas U. S. A.

partment, those oil companies with assets of more than 100 million dollars took percentage depletion allowances equal to 13 times their actual depletion (or depreciation). . . .

"Fortune magazine has called depletion 'the sweetest combination in business.'

"President Truman said no other loophole is 'so inequitable.'"

The Cooperative Consumer, Consumers Cooperative Association.

Research Problem

"A research and development organization must be a bunch of magicians to overcome such a serious handicap as imposed by our tax laws. It becomes more and more difficult to create something new which can pay for itself in a sufficiently short time so that risk is within reason.

"Unless our tax structure is changed radically so that it does not destroy incentive, the time will soon come when very little research and development can be justified. Why spend money on research and development if the product cannot be justified because of the tax laws?

"Were it not for the hope that our lawmakers will soon recognize their errors and correct the adverse features of the tax structure our industrial research and development budgets would be only a small fraction of their size today. The incentive for research and development and the competition between private research and development organizations must not be hindered in any way. Ours is a technological economy and nothing should be permitted to discourage its progress."

C. G. Kirkbride, vice president, Houdry Process Corp., speaking before American Institute of Chemical Engineers, Atlantic City.

CALENDAR

January

Compressed Gas Association, Inc., annual meeting, Waldorf-Astoria, New York City, January 21-22.

American Institute of Electrical Engineers, winter general meeting, Hotel Statler, New York City, January 21-25.

February

American Society for Testing Materials, Committee D-2 on petroleum products and lubricants, Shoreham Hotel, Washington, D. C., February 3-8.

Missouri Petroleum Association, annual convention and trade exhibit, Jefferson Hotel, St. Louis, February 4-6.

Instrument Society of America, New York Section, power-plant symposium, Hotel Statler, New York City, February 7-8.

American Petroleum Institute, Division of Marketing, lubrication-committee meeting, Hotel Book-Cadillac, Detroit, February 18-19.

Wisconsin Petroleum Association, twenty-sixth annual convention and equipment show, Milwaukee Auditorium, Milwaukee, February 26-27.

American Association of Petroleum Geologists, Rocky Mountain Section, annual meeting, Salt Lake City, February 28-29.

Natural Gasoline Association of America, Permian-Basin regional meeting, Lincoln Hotel, Odessa, Tex., February 29.

March

Manufacturers Standardization Society of Valve and Fittings Industry, annual meeting, Hotel Commodore, New York City, March 3-5.

American Society for Testing Materials, spring meeting, Hotel Statler, Cleveland, March 3-7.

American Petroleum Institute, Division of Production, southwestern district, Washington-Youree Hotel, Shreveport, March 5-7.

National Association of Corrosion Engineers, eighth annual conference and exhibition, Galvez Hotel, Galveston, Tex., March 10-14.

Illinois Petroleum Marketers Association, annual convention, Hotel Sherman, Chicago, March 11-13.

Texas Oil Jobbers Association, Inc., annual spring convention and refiners and suppliers exhibit, Hotel Adolphus, Dallas, March 12-13.

American Institute of Chemical Engineers, regional meeting, Atlanta, March 16-19.

Ohio Petroleum Marketers Association, annual convention and marketing exposition, Deshler-Wallick Hotel, Columbus, Ohio, March 18-20.

American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita, Kans., March 21.

American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, joint annual meeting, Biltmore Hotel, Los Angeles, March 23-27.

Texas Independent Producers and Royalty Owners Association, sixth annual meeting, Fort Worth, March 27-28.

Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, March 31-April 2.

Mid-West Gas Association, annual meeting, Hotel Radisson, Minneapolis, Minn., March 31-April 2.

April

American Petroleum Institute, Division of Production, eastern district, Hotel William Penn, Pittsburgh, April 2-4.

Florida-Georgia Gas Association, annual convention, Soreno Hotel, Saint Petersburg, April 3-5.

Missouri Liquefied Petroleum Gas Association, Hotel President, Kansas City, Mo., April 7-9.

Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, April 8-10.

American Institute of Electrical Engineers, District 7 meeting, Hotel Jefferson, St. Louis, April 15-17.

National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland, April 16-18.

American Petroleum Institute, Division of Transportation, pipe-line conference, Blackstone Hotel, Fort Worth, April 21-23.

American Petroleum Institute, safety and fire-protection committees, Hotel Texas, Fort Worth, April 21-24.

American Petroleum Institute, Division of Production, Rocky Mountain district, Gladstone Hotel, Casper, Wyo., April 24-25.

Indiana Gas Association, annual meeting, French Lick Springs Hotel, French Lick, Ind., April 24-25.

Southern Gas Association, annual convention, Galveston, Tex., April 28-30.

American Oil Chemists' Society, spring meeting, Shamrock Hotel, Houston, April 28-30.

American Institute of Electrical Engineers, District 1 meeting, Binghampton, N. Y., April 30-May 2.

Natural Gasoline Association of America, annual meeting, Rice Hotel, Houston, April 30-May 3.

May

American Geophysical Union, thirty-third annual meeting, National Academy of Sciences, National Research Council, Washington, D. C., May 5-7.

performance . . .

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and

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produce special solvents tailored to your needs

You'll find the special solvents produced by Roosevelt will help you produce products to meet your high-quality standards. *Complete* catalytic sulphur removal from Roosevelt's aliphatic naphthas means non-corrosive, chemically stable solvents, free of offensive odors... **Flexible Kaskade-type fractionating towers,** plus constant quality-control analysis means every shipment will meet your specifications. Send us your solvent specifications today!

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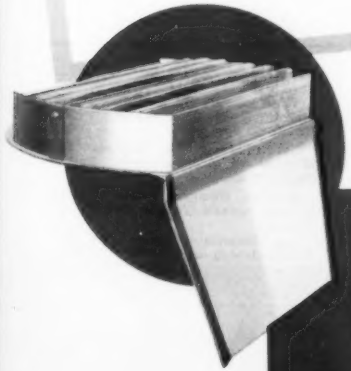

You, too, can satisfy your most critical product requirements...and step up tower capacities and efficiencies with Koch Kaskade trays. *Write for Bulletin No. 629.*

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REPRESENTATIVES

American Institute of Chemical Engineers, regional meeting, French Lick, Ind., May 11-14.

American Association of Petroleum Geologists, regional meeting, Mayo Hotel, Tulsa, May 12-13.

American Gas Association, Natural Gas Department, spring meeting, Biltmore Hotel, Los Angeles, May 12-13.

American Petroleum Institute, Division of Refining, seventeenth midyear meeting, San Francisco, May 12-15.

Pennsylvania Gas Association, Wernersville, Pa., May 13-15.

American Petroleum Institute, Division of Production, Pacific Coast district, Biltmore Hotel, Los Angeles, May 15-16.

American Petroleum Institute, division of marketing, midyear meeting, Copley Plaza, Boston, May 18-19.

American Petroleum Institute, Division of Marketing, midyear meeting, Copley Plaza Hotel, Boston, May 19-20.

Gas Appliance Manufacturers Association, annual meeting, Broadmoor Hotel, Colorado Springs, Colo., May 21-23.

American Gas Association, production and chemical conference, Hotel New Yorker, New York, May 26-28.

Society of Exploration Geophysicists, Gulf Coast regional meeting, Rice Hotel, Houston, May 29-30.

Seventh annual short course in gas technology, sponsored by the Southern Gas Association, Texas College of Arts and Industries, Kingsville, Tex., May 29-31.

June

Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh, June 5-6.

Canadian Gas Association, Chateau Frontenac, Quebec, June 8-12.

American Petroleum Institute, midyear standardization meeting, Brown Palace Hotel, Denver, June 9-14.

International Gas Conference, Brussels, Belgium, June 16-22.

Petroleum Equipment Suppliers Association, Mark Hopkins Hotel, San Francisco, June 22-25.

American Society for Testing Materials, annual meeting, Hotel Statler, New York, June 23-27.

American Institute of Electrical Engineers, summer general meeting, Hotel Statler, New York City, June 23-27.

September

Pacific Coast Gas Association, Ambassador Hotel, Los Angeles, September 3-5.

American Institute of Chemical Engineers, regional meeting, Palmer House, Chicago, September 11-13.

American Association of Oilwell Drilling Contractors, annual meeting, Skirvin Hotel, Oklahoma City, September 28-30.

October

Texas Mid-Continent Oil and Gas Association, thirty-third annual meeting, Hotel Texas, Fort Worth, October 13-15.

November

American Petroleum Institute, annual meeting, Chicago, November 10-13.

December

American Institute of Chemical Engineers, annual meeting, Hotel Cleveland (Hqs.) and Carter Hotel, Cleveland, December 7-10.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

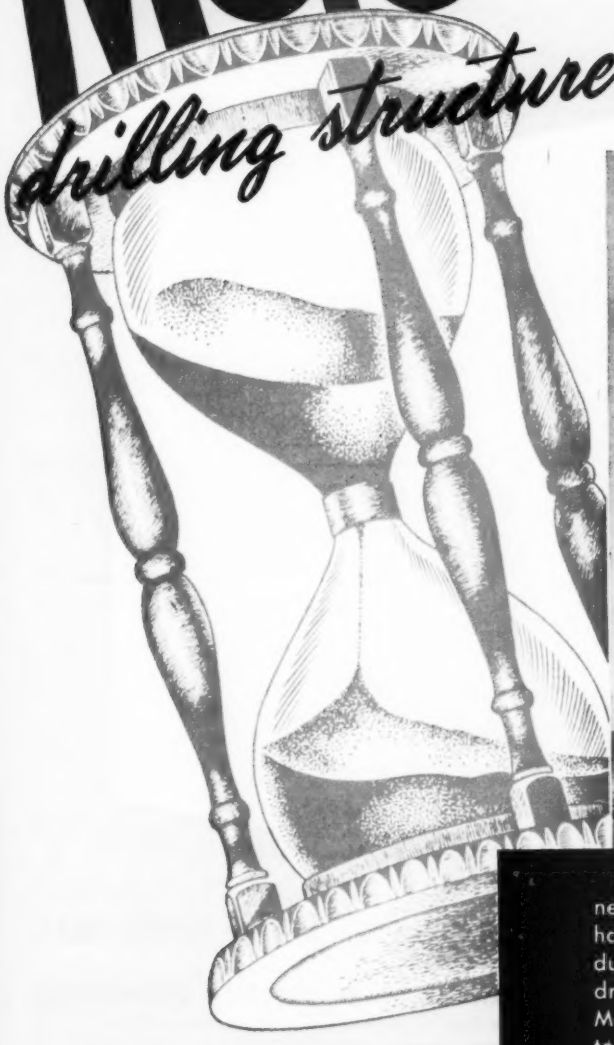
Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

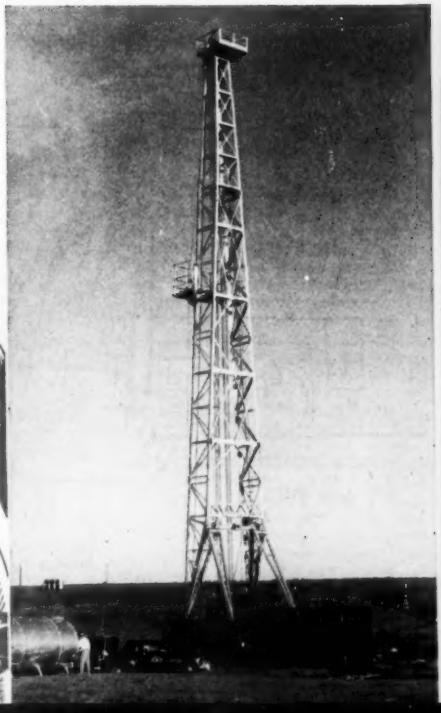
Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

LEE C.

Moore

drilling structures since 1907





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JOURNALLY Speaking

Mean Oil Center

WHAT'S the oil center of the world? Tulsa? Houston? Williston, N. D.? Nope, that's just chamber of commerce propaganda. You just don't know your geography.

Take it from a real expert, the oil center of the world is in the North Atlantic Ocean, near Iceland.

This is not another one of those offshore oil claims of the federal Government, although we would not be surprised if some eager-beaver bureaucrat asks the Supreme Court to assert jurisdiction over this watery region.

However, as might be suspected, it is a government official who makes the astonishing statement that the center of world oil is where there's not a drop of production and never will be. But it's not as crazy as it sounds.

The expert in question is Sherman R. Abrahamson, whose title is economic geographer, no less, in the U. S. Bureau of Mines. And we challenge anyone to dispute his findings, because he used the centrographical method of plotting data on an azimuthal equidistant projection, and you can't beat that.

By means of his centrographical etc. method, Abrahamson determined that back in 1929 the center of the world's oil production was right smack in the middle of Wisconsin. (Bet you didn't know that, either.) But in the intervening years the production center has moved more than 1,000 miles northeast, and is now on the coast of Labrador. The center of the world's crude reserves is currently on the coast of Norway, close to the Arctic Circle. It should be explained that these are not physical centers, nor financial or operating centers, but geographical mean centers, and we mean mean. Putting the production and reserves centers together places the world's oil center between Iceland and Greenland, also a pretty mean center.

At first glance this incidental intelligence might seem to be the tortured cerebrations of a scientific boondoggler, but it isn't. Abrahamson used it to dramatize the importance of Middle East oil. It served as an introduction to a scholarly treatise on possible future trends in petroleum production, consumption, shipments, and prices throughout the world. The rest of Abrahamson's paper is full of useful facts and forecasts, and such material, of course, has no place on this page.

Hobby Corner

THIS department seems to be the only one in the Big Yellow Book which gives a hang about oil men's hobbies, so we hasten to make a bow to George Link, 48, of Bunker Hill, Ill., a foreman in the stills at the Wood River refinery of Standard Oil Co. (Ind.) and an employe of that firm for 26 years.

George has won the Male Crochet Championship. No, not croquet, crochet. He's the best man threadhooker in the oil business or any other business in the whole U.S.A., and he has an engraved trophy to prove it. He copped top honors in the Men Only classification of the National Crochet Contest (of course you know what that is). His entry, which took him 6 months to make, was a tablecloth crocheted "in large square motifs of shadow filet," and if you don't know what that means, ask your wife. The tablecloth won first award at the Illinois State Fair last fall and then went to New York and walked off with the national sweepstakes, which is the equivalent of the world series to fanciers of the gentle art of needlework.

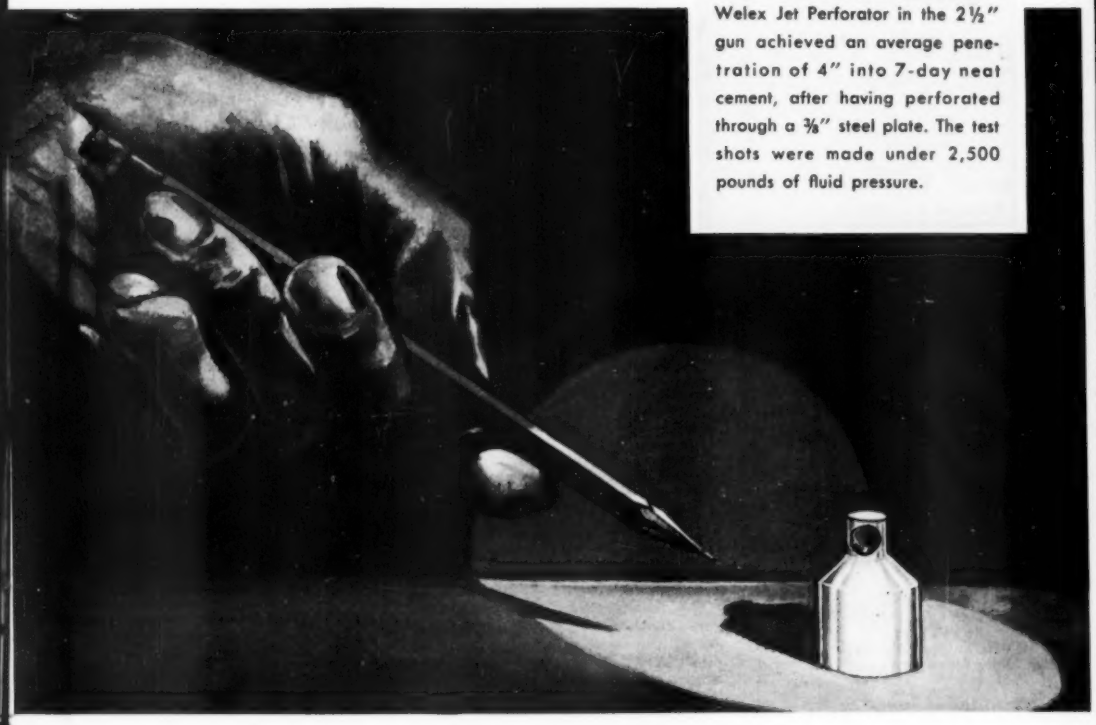
George started crocheting when he was confined to bed with an illness as a kid, and has been at it ever since in his spare time—at home, of course, not at the refinery. The press release from the National Needlecraft Bureau, Inc., says that George's wife knows nothing whatsoever about crochet, which probably explains why George kept at it and became so successful.

And speaking of oil men's hobbies, we hear of a young man who made a quick fortune in oil production, retired and now collects French modern paintings. A visitor was astounded by the fact that he had 40 paintings on the walls of his small apartment, but what astounds us is how he could accumulate enough money to retire young, what with taxes the way they are today.

—*Henry D. Ralph.*

DEEPER PENETRATION
in small diameter pipe
with the
New Welex 2½-inch Jet Gun

In a test conducted by a major oil company this midget size Welex Jet Perforator in the 2½" gun achieved an average penetration of 4" into 7-day neat cement, after having perforated through a ⅜" steel plate. The test shots were made under 2,500 pounds of fluid pressure.



Both field experience and laboratory tests indicate that the Welex 2½" gun with its improved Jet Perforator Charge is giving consistently deeper penetration than any other perforator of comparable size. With this precision equipment Welex gives you deep, positive perforating in drill pipe and casing down to 3" I.D., with positive hole density.

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the OIL AND GAS JOURNAL

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• NEWS FEATURES

• ENGINEERING-OPERATING FEATURES

• EXPLORATION-DEVELOPMENT

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Iso-Butane
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Normal Pentane
Hexane
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Crude Oil, Natural Gasoline and Liquefied Petroleum Products

Oil's Ugly Duckling

Remember the fable of the ungainly cygnet hatched with a brood of ducklings, scorned and unwanted by the flock, which grew into a beautiful swan? The story of sulfur in oil and gas comes close to being a parallel.

Sulfur still has many attributes of an ugly duckling—and may never be exactly a swan—but at least the detested contaminant is beginning to pay its own way and may pull its foster parent, petroleum, out of a difficult spot by providing it with sulfuric acid during a period of world shortage.

The presence of sulfur makes crude oil or natural gas "sour"; it eats holes in the pipes, fouls up the processing, and lowers the price. Getting rid of it has always been a costly headache.

The petroleum industry has had to install much expensive equipment to handle sour crudes and gas and to extract the sulfur in order to make products of acceptable specification. But even after it was separated, the sulfur was a problem. It couldn't be dumped down streams, and the burning of high-sulfur waste gas or oil sludge polluted the air.

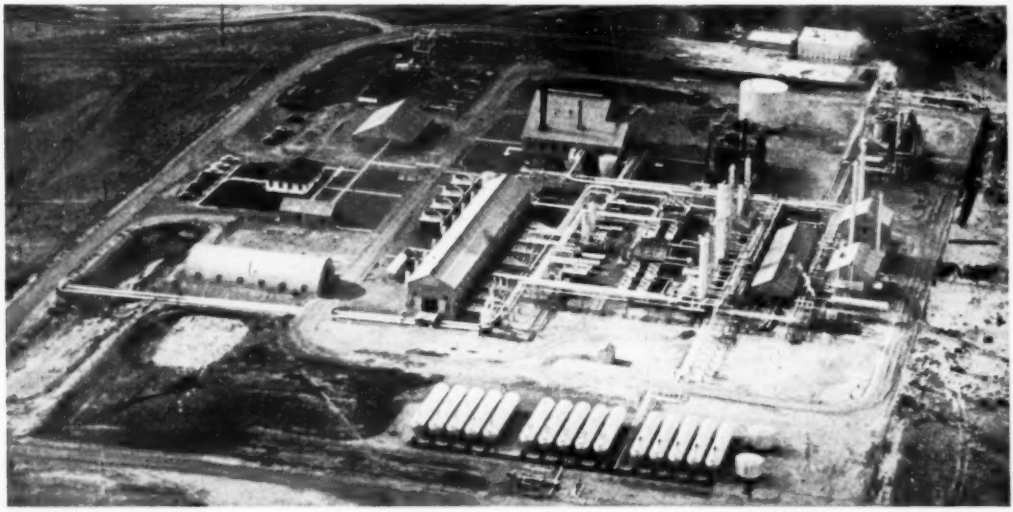
It was largely to do its part as a good citizen in reducing stream and air pollution that the industry, a decade or so ago, began experiments to turn its sulfurous wastes into a merchantable product. Sulfur, in both its elemental and sulfuric acid forms, is essential to many industries, including petroleum refining. Until recently abundant and cheap, sulfur is suddenly scarce and before long may become more expensive.

Now the petroleum industry stands to reap a second payoff from its development of sulfur-extraction processes. The first payoff was in upgrading sour crude and gas to make products acceptable to consumers. The second will come from having its own supply of sulfur. Already petroleum is producing more sulfur than it uses, which puts it in a highly favorable position in obtaining allocations of sulfur for refining purposes. Its total volume is about 5 per cent of the nation's sulfur production, not a great volume but highly important right now—so important, in fact, that other industries are becoming interested in oil and gas as a sulfur source.

This development is a great aid to the cause of conservation. The sour gas and crude which were once flared, burned as boiler fuel, or used for inferior purposes can be transformed into more valuable products and the sulfur extracted in the process can be sold to help pay for the operation. Taken as a whole, the petroleum-from-sulfur business probably is not highly profitable as yet, but it brings in a nice piece of change and the future financial outlook is rather bright.

This sulfur story is characteristic of the petroleum industry: Technological development, spurred by the desire to promote conservation and reduce pollution, turns an ugly duckling waste material into an essential commodity of commerce and a profitable byproduct.

THIS WEEK



NEW TREND IN OIL.—Scarcity of sulfur has turned the oil industry's attention increasingly toward its own sour gas and crude oil as a source of the needed chemical. Construction of new plants is under way in several areas, and still more plants are planned. Shown here is the Elk basin, Wyoming, natural-gasoline plant of Stanolind Oil & Gas Co.—and in back of its gas-processing facilities is its sulfur-recovery plant. A comprehensive article on the world-wide trend in petroleum-sulfur recovery begins on the opposite page.

STEEL.—Defense Mobilizer Wilson says oil industry will get sufficient steel this year to carry out 45,000-well drilling program. . . . Adequate supply also seen to provide for 1,000,000-bbl. daily increase in refining capacity. . . . Nondefense activities to feel pinch as shortages continue into 1953. . . . ¶NPA order will result in increased supply of wire rope for drilling wells, PAD says. . . . ¶Second-quarter steel allocations may be slightly less than for current period, Fleischmann indicates, adding some big pipe-line projects may be held up for lack of pipe. . . .

INDUSTRY.—More expansion planned for recovery of critically short sulfur even as petroleum industry nears peak in construction of new facilities. . . . Actual recovery of sulfur from petroleum in U. S. this year may reach 1,350 long tons daily. . . . ¶K. C. Heald of Gulf named recipient of A.A.P.G.'s Sidney Powers Memorial Medal. . . . ¶Strike of 1,800 workers halts operations at Tide Water's Bayonne, N. J., refinery. . . .

AGENCIES.—Bruce Brown of PAD tells I.P.A.A. counsel that agency is not favoring foreign operations at expense of domestic activity. . . . Declares PAD's responsibility is world wide but record shows it has not lost sight of obligations to own country. . . . ¶FTC says foreign agreements of U. S. oil companies fix prices, curtail competition. . . .

IMPORTS.—Texas Railroad Commission chairman says flood of imports of foreign oil in 1952-53 will create many new problems for Texas' domestic producers. . . . ¶Tariff Commission sets quotas for foreign-oil imports at 10½-cent excise-tax rate through 1952 in same ratio as 1951. . . .

CANADA.—McColl-Frontenac planning new $12,000,000 refinery at Winnipeg. . . . ¶Northwest Natural asks FPC to approve export of gas into U. S. . . . ¶Imperial Oil plans $24,000,000 expansion of two refineries. . . .

TRENDS.—Distillate stocks decreased 12,516,000 bbl. for the 4-week period ended December 29. . . . Over 6,000,000 bbl. of the total decrease was in District 1. . . . District 3 stocks were down only 1,570,000 bbl. for the 4 weeks and were up 58,000 bbl. for the week of December 29, indicating a possible influence of the abnormally low differential between Gulf Coast and East Coast price ceilings.

ACTIVITY.—Crude and lease condensate production averaged 6,106,560 bbl. daily for week ended January 5, down 24,765 bbl. daily for the week. . . . ¶Total completions for week ended January 5 decreased 1 well to 859. . . . ¶Wildcat completions increased 12 wells to 206. . . . ¶Rotary rigs operating in United States on December 31 totaled 2,813 compared with 2,898 a week earlier and 2,293 a year ago. . . .

PIPE LINES.—Contractors planning another big construction year. . . . Oil trunk-line construction will reach new peak but race in big-inch gas lines apparently is over. . . . More than 4,000 miles of products carriers to be built in 1952. . . .

INTERNATIONAL.—Pemex plans to drill 400 new wells this year, expand refining, pipe-line facilities. . . . ¶Kirkuk development increased to provide facilities needed when big-inch crude line to Banias is completed. . . . ¶First phase of Port Jerome refinery expansion completed. . . . ¶Zubair field starts first commercial oil production. . . .

Oil's Sulfur Boomlet

Industry nearing peak in its sulfur-recovery construction program, but the long-term outlook is for more expansion

George Weber

WITH a $10 million construction program now under way, the petroleum industry is nearing the probable peak of a minor boom in recovery of sulfur from natural and refinery gases.

Already a net producer of that critical chemical raw material, the industry is expected to double production within the next 2 years.

By comparison with either the oil or the sulfur industry, the recovery program is small potatoes. But its importance has been highlighted by an urgent demand for sulfur which developed largely during the past year.

Petroleum sulfur is never expected to capture a major share of the business. At present, less than 5 per cent of all sulfur produced in this country comes from crude oil and natural gas. But the relatively small increments now available in the form of hydrogen sulfide at natural-gasoline plants and refineries are being eagerly sought by hard-pressed consumers, including several oil companies.

As a result of the current shortage and the attending allocation based on 90 per cent of 1950 consumption, many sulfur-recovery projects now under way or projected are based on an immediate need for that element, with higher production costs a secondary consideration. Thus the normal economics governing sulfur recovery from petroleum are being disregarded in many instances.

The current development is by no means temporary, however, for petroleum sulfur stands on sound economic ground in the extended future. While the present imbalance will probably be alleviated in a year or two by the addition of new capacity for producing brimstone from Gulf Coast salt domes, long-range prospects indicate a gradual increase in sulfur recovery from alternate, higher-cost sources. In this projected future situation, petroleum-sulfur operations will hold a firm competitive position with respect to pyrites, smelter gas, and other costly recovery methods.

Plant survey.—A comprehensive study conducted at the end of 1951, shows widespread sulfur-recovery activity throughout the oil industry.

As shown in the accompanying table, 16 domestic plants are now recovering sulfur in elemental or acid forms. Capacity of these operating plants in equivalent sulfur is 1,125 long tons per day. Since many plants are operating at less than rated capacity, actual production is only about 800 long tons per day.

On January 1, nine plants were under construction, including new units and expansion of existing ones. These added facilities will come into operation during 1952 and will augment recovery capacity by 450 tons per day.

Fifteen more projects are definitely planned or under serious consideration. These plants have an estimated total capacity of 525 tons per day. Some of these new plants will be in operation before the end of the year, while most of the remainder are expected to be completed during 1953. Thus, present operations are expected to double within the next 2 years.

Production estimate.—Actual recovery of sulfur from petroleum in the United States may conservatively be expected to reach a rate of 1,350 long tons per day by the end of 1952 (see chart). Projection through next year indicates that the rate in 1953 will exceed 1,800 tons per day.

These estimates disregard a number of proposed projects known to be involved in negotiations but which have not yet been announced. Construction progress also is estimated on the slow side. Therefore, it is possible that 1952 construction may double the recovery rate before January 1953.

On the other side of the picture, there is the possibility that some projects which have already been granted accelerated amortization certificates may be postponed or abandoned. An example is the plant proposed for Silver Tip, Wyo.

Seaboard Oil Co. originally planned a recovery plant to produce sulfur from its sour-gas production in that field. The project was later taken over by Rayonier, Inc., and two other sulfur consumers, which planned to erect a 70-ton plant. Recently, the plans were abandoned in favor of shifting the whole operation to the nearby recovery plant operated by Stanolind Oil & Gas Co. at Elk Basin. With unused capacity, Stanolind will take sour natural gas through a 15-mile pipe line, extract the hydrogen sulfide, and recover elemental sulfur for the principals involved.

This may require some expansion in Stanolind's plant, but such a decision has not yet been reached.

Present sources.—Natural gas serves as the source of most sulfur both for present operations and those in immediate prospect.

This is because the largest concentrations of hydrogen sulfide are readily available at natural-gasoline plants operating on sour gas.

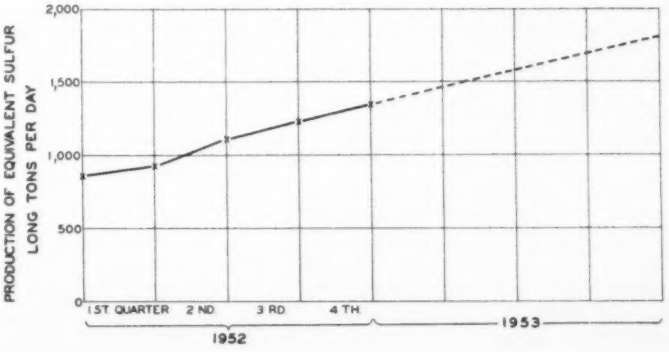
As these larger volumes of convertible sulfur are committed for recovery, the trend may swing more heavily to refinery sources due to certain advantages in geographic location and plant integration.

Natural gas.—The more spectacular developments in sulfur recovery have been based on natural gas. These projects are centered in three major sour-gas areas: the Permian basin of West Texas and New Mexico, the Big Horn basin of Wyoming, and the Louann basin embracing South Arkansas, Central Mississippi, and East Texas.

The Panhandle, California, and other sour-gas areas are also likely locations for additional projects. In fact, one of the largest projects yet proposed is rumored to be under negotiation for the Panhandle.

The Permian basin leads in the number of prospective plants, with

Estimated U. S. Sulfur Recovery From Petroleum Sources



MAKING SULFUR.—This plant of Petroleos Mexicanos processes Poza Rica field gas, turns out 137 tons per day.

nine projects under way or planned. For the present, Wyoming leads in actual production and is likely to hold the lead with two major operations. South Arkansas, where the first elemental-sulfur recovery project was built near the close of World War II, ranks second in current production.

The prospects are good for another major project in the Louann basin. Last year a gas discovery in Rains County, East Texas, showed the highest hydrogen sulfide content yet developed. This almost certainly presages a major recovery project whose size will be determined by the extent of proven gas reserves. Shell Oil Co. is considered the most likely operator, due to its interest in the discovery well.

Acid plants.—Refinery gas presently plays a minor role as a sulfur source, but it shows promise of considerable additional development, particularly through sulfuric acid regeneration.

Sulfur recovery in the form of acid has been generally disregarded in past surveys on sulfur conservation. But it is equally important. Today, seven acid plants convert hydrogen sulfide to sulfuric acid. They are served by nine refineries.

Hydrogen sulfide, or acid gas separated from cracked light ends, is burned in furnaces along with spent acid sludge, pure sulfur, and in some cases, pyrites. Sulfur dioxide in the combustion gases is concentrated, catalytically converted to sulfur trioxide, and absorbed in water to produce sulfuric acid.

This operation marked the first recovery of sulfur from petroleum. In 1935, Atlantic Refining Co. completed a new combination thermal cracking unit. The additional hydrogen sulfide produced with light ends in the new unit was added to the furnace charge in the refinery acid regenerator. Atlantic's dual success in converting a troublesome air pollutant to usable acid led others to adopt the same operation.

Esso Standard Oil Co. followed with a similar operation at Linden, N. J., a few years later, and the practice was carried to the Pacific Coast with the construction of acid plants by General Chemical Division of Allied Chemical & Dye Corp., which recovers sulfur from four California refineries.

Up to the end of 1951, an estimated 310,000 long tons of petroleum sulfur had been recovered in acid form in refineries and adjacent chemical plants. The present recovery rate exceeds 160 long tons per day of equivalent sulfur. Additional projects under consideration will add from 35 to 50 more tons to daily recovery totals. Many more refiners are now considering this method of recovering sulfur and eliminating a serious pollution problem.

Prospective refinery sources.—A number of major refineries processing sour crudes represent likely prospects for sulfur recovery in either elemental or acid form.

Nearly all California plants are already tied to existing or proposed projects, as are most of the major refineries along the Gulf Coast. Several East Coast plants, including those in Montreal, Canada's major refining center, are considering sulfur projects.

Due to the large volumes of sour imported crudes charged to stills in East Coast refineries, they are expected to prove important sources for recovered sulfur in the future. The St. Louis refining area remains undeveloped for sulfur recovery, and hydrogen sulfide in economically recoverable volumes is available for future projects in Chicago, Rocky Mountain, Toledo, and other refining centers.

Foreign operations.—Since the sulfur shortage results largely from export commitments to the free world, foreign petroleum-sulfur projects have a direct bearing on domestic supply and demand. Five new projects are now being added to the two existing foreign recovery units, and some major developments are in the offing.

Canada figures prominently in the picture with two plants under construction and a prospective third project which may prove to be the world's largest. Gulf Oil Corp. is planning a unit at Pincher Creek which may recover up to 500 long tons per day. The program is contingent on the laying of a major gas pipe line to provide an outlet for sour-gas reserves in the southeastern Alberta field.

Mexico, with a major plant at Poza Rica, operated by General Chemical, is in line for a second unit. Petroleos Mexicanos proposes to construct a unit to recover sulfur from refinery gas produced at the Atzcapotzalco refinery.

Three European refineries will provide acid gas to as many recovery units now under construction. The record growth of refining capacity in Europe, based primarily on sour Middle East crudes, indicates that several additional recovery projects may be added to aid in supplying critical national requirements for sulfur.

Recovery economics.—Even before sulfur became critically short, the economics of recovering sulfur from petroleum sources defied generalization. Geographic location, availability, pollution control, and other factors gave each plant a different economic outlook.

Today, when sulfur consumers are primarily concerned with augmenting their supplies, normal plant economics are being relegated to second consideration.

A unit production of 20 to 25 tons

per day has been widely quoted as the economic minimum to justify a sulfur plant. This no longer holds. Lion Oil Co. is satisfactorily operating a 10-ton plant in South Arkansas. Other plants with capacities as low as 3 tons per day are operating economically on hydrogen sulfide from other than petroleum sources.

While each sulfur-recovery project must be judged on its own merits, there are over-all trends which indicate that the future of petroleum sulfur operations is promising and that more and more plants will be built.

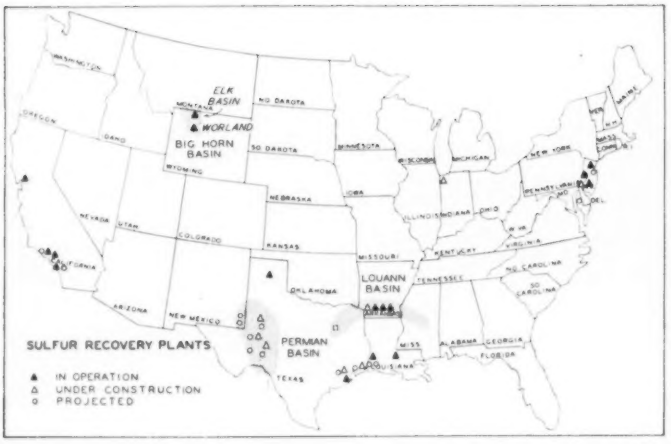
These trends in factors which influence the oil industry's sulfur operations include price, government in-

Petroleum Sulfur-Recovery Projects

(All figures in long tons of equivalent sulfur per day)

Company and plant location—	Operating plants		New facilities, under		Contractor*	Remarks
	Capacity	Operation	Construction	Consideration		
UNITED STATES—SOURCE: NATURAL GAS						
Gulf Oil Corp., Waddell, Tex.	....	....	....	20	.....	.....
Lion Oil Co., Magnolia, Ark.	10	10	....	....	Graff	Cost: $67,858
Mathieson Chemical Co., Stamps, Ark.	125	90	35	....	Fluor	Expansion cost: $198,990
Mathieson Chemical Co., Magnolia, Ark.	75	40	....	....	.....	.....
Phillips Chemical Co., Crane County, Texas	....	....	....	50	.....	Est. cost: $510,200
Phillips Chemical Co., Goldsmith, Tex.	....	....	140	....	Parsons	Cost: $1,741,000
Phillips Chemical Co., Eunice, N. M.	....	....	....	100	.....	Est. cost: $1,498,000
Shamrock Oil & Gas Co., Sunray, Tex.	30	30	....	....	Fluor	Cost: $195,500
Sid Richardson Gaso. Co., Kermit, Tex.	....	....	....	25	.....	.....
Sid Richardson Gaso. Co. and Odessa Natural Gaso. Co., Odessa, Tex.	....	....	20	....	Graff	Cost: $130,830
Stanolind Oil & Gas Co., Elk Basin, Wyo.	80	35	....	....	Stone & Webster	Will process Silver Tip gas for Rayonier et al
Stanolind Oil & Gas Co., Sundown, Tex.	....	....	50	....	Fluor	.....
Stanolind Oil & Gas Co., North Cowden, Tex.	....	....	....	20	.....	.....
Texas Gulf Sulphur Co., Worland, Wyo.	400	300	....	....	Girdler, Foster Wheeler, Braun	.....
Warren Petroleum Corp., Monument, N. M.	....	....	....	14	.....	.....
Total from natural gas	720	505	245	229		
UNITED STATES—SOURCE: REFINERY GAS						
Atlantic Refining Co., Philadelphia	10	†10	....	†5	Chemico	In operation 15 years
Atlantic Refining Co., Atreco, Tex.	....	....	....	16	.....	.....
Cities Service Ref. Corp., Lake Charles, La.	20	†12	....	40	.....	.....
Consolidated Chemical Industries, Inc., Baton Rouge	50	30	....	....	Parsons	H_2S from Esso. Cost: $500,000
Consolidated Chemical Industries, Inc., Baytown, Tex.	....	....	....	†30	.....	H_2S from Humble
Davison Chemical Co., Linden, N. J.	....	....	....	60	.....	H_2S from Esso
Davison Chemical Co., Baltimore	....	....	....	25	.....	H_2S from Esso
Esso Standard Oil Co., Linden, N. J.	15	†14	....	....	.....	.....
Freeport Sulphur Co., Westville, N. J.	40	20	....	....	Girdler	H_2S from Texas Co.
General Chemical Div., Allied Chem. & Dye Corp., El Segundo, Calif.	75	†50	....	....	.....	H_2S from Standard of Calif., Wilshire and Union
General Chemical Div., Allied Chem. & Dye Corp., Richmond, Calif.	50	†30	....	....	.....	H_2S from Standard of Calif.
Gulf Refining Corp., Port Arthur, Tex.	....	....	60	....	Parsons	Cost: $586,390
Hancock Chemical Co., Long Beach, Calif.	100	90	20	....	Badger	H_2S from Hancock, Richfield and Texas Co. Expansion cost: $250,000
Shell Chemical Co., Houston	....	....	50	....	Parsons	Cost: $500,000
Sinclair Refining Co., Marcus Hook, Pa.	....	....	20	....	Parsons	Cost: $320,000
Standard Oil Co. (Ind.), Whiting, Ind.	....	....	55	....	Fluor	Cost: $1,720,000
Stauffer Chemical Co., Wilmington, Calif.	30	†30	....	....	.....	H_2S from Shell
Texas Co., Port Arthur, Tex.	....	....	....	25	.....	.....
Tide Water Assoc. Oil Co., Avon, Calif.	....	....	....	30	.....	.....
Union Oil Co. of California, Wilmington, Calif.	....	....	....	65	.....	.....
Union Carbide & Carbon Corp., Texas City, Tex.	15	†15	....	....	.....	H_2S from Pan American
Total from refinery gas	405	301	205	296		
Total United States, all sources	1,125	806	450	525		
FOREIGN—ALL SOURCES						
Albatross Superphosphate Co., Pernis, Netherlands	....	....	12.5	....	.....	H_2S from Shell refinery
Esso Petroleum Co., Ltd., Fawley, England	....	....	33	....	Foster Wheeler	H_2S from Esso refinery
Gulf Oil Corp., Pincher Creek, Alta., Canada	....	....	....	350-500	.....	H_2S from nat. gas
Iranian National Oil Co., Abadan, Iran	50	0	....	....	.....	Shut down
Petroleos Mexicanos, Poza Rica, Mexico	140	137	....	....	McKee	H_2S from nat. gas
Petroleos Mexicanos, Atzcapotzalco, Mexico	....	....	....	27.5	.....	H_2S from Pemex refinery
Royalite Oil Co., Ltd., Turner Valley, Alta., Canada	....	....	30	....	Foster Wheeler	H_2S from nat. gas Cost: $275,000
Shell Oil Co. of Canada, Jumping Pound, Alta., Canada	....	....	30	....	Fluor	H_2S from nat. gas Cost: $500,000
Shell Group, Stanlow, England	....	....	27.5	....	.....	H_2S from ref. gas.
Trinidad Leaseholds, Ltd., Point-a-Pierre, Trinidad	....	....	....	....	.....	H_2S from ref. gas.
Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina	....	....	....	30	.....	H_2S from ref. gas.
Total foreign	190	137	133	407.5-557.5		

*Contractors include: Badger Process Division, Stone & Webster Engineering Corp., Boston; C. F. Braun & Co., Los Angeles; Chemical Construction Co., New York; Fluor Corp., Los Angeles; Foster Wheeler Corp., New York; Girdler Corp., Louisville; Graff Engineering & Construction Co., Dallas; Arthur G. McKee & Co., Cleveland; Ralph M. Parsons Co., Los Angeles; and Stone & Webster Corp., Boston. †Equivalent sulfur produced in the form of sulfuric acid.



WHERE THEY ARE.—This United States map shows the location of petroleum sulfur plants now operating, under construction, or to be built soon.

centives, improved techniques, pollution control, and increased sulfur requirements.

Price factor.—At $22 to $23 per ton, the price of sulfur has risen only 25 per cent above the 1935-39 average. Since that prewar period, demand on domestic production has increased nearly threefold.

The recovery of low-cost brimstone from salt domes in the Gulf Coast has dominated world supply for the past 30 years and is responsible for the continuing low cost of sulfur. But this supply cannot now meet expanded demand. New reserves coming on production are expected to ease the situation.

Some analysts responsible for predicting the long-range future believe, however, that low-cost brimstone cannot for long meet the total demand of the free world. They see a gradual return to higher-cost production from the enormous reserves available from pyrites, smelter gas, petroleum, gypsum, and coal.

Closing the gap with these sources would entail higher sulfur prices, which, in turn, would bring into the economic picture further petroleum sulfur operations which do not presently appear feasible.

Government encouragement.—For the duration of the present shortage, the Government may be expected to continue to permit rapid plant write-off on new sulfur plants.

New projects are also exempt from allocation rulings. This means that companies with new sulfur plants can absorb their full production. As a result, much of the sulfur to be recovered from petroleum will be a captive product, not available on the market.

To date, the Government has approved for rapid amortization 79 per cent of the estimated cost of new plants. This places sulfur among the 10 most favored industrial categories among the 135 for which accelerated amortization is being granted.

Availability.—Another reason for expecting the sulfur-from-petroleum industry to expand is the prospect for increased production of easily converted hydrogen sulfide.

The trend in both natural-gasoline plant and refinery operations is expected to continue sharply upward. In addition, new pipe-line outlets for remote sour crude and natural-gas production will increase the percentage of sulfur in future expanded operations in both plant and field.

Also, the conversion to hydrogen sulfide of sulfur compounds present in crude oils is increasing, due to a swing toward catalytic desulfurization.

The nation's basic catalytic cracking capacity is now undergoing a record expansion. Catalytic reforming is being widely adopted. As compared with thermal cracking, these processes will produce more than 50 per cent more hydrogen sulfide from the same sour feed stocks. The pattern of increases in crude capacity and catalytic cracking capacity is most pronounced in the larger refineries.

These factors combine to concentrate more hydrogen sulfide in major refining centers, thus improving the economic justification for added recovery operations.

Engineering developments. — The improved techniques for recovering petroleum sulfur comprise an important factor.

Basically, the efficiency of the Girbotol process has justified its past use to a wide extent for the sole purpose of removing undesirable hydrogen sulfide from light gases and liquids. The existence of extensive gas-treating facilities throughout the industry is largely responsible for the present sulfur boom based on availability of that gas for direct conversion to sulfur and acid.

Numerous improvements in the basic Claus process for recovering sulfur from hydrogen sulfide have also contributed to the trend. The participation of several engineering and construction firms in this field indicates a favorable competitive situation which should lower investment and operating costs to bring more plants into the economic picture in the future.

Pollution control. — A further factor contributing to future expansion in sulfur recovery is the progressive attitude of oil companies regarding air pollution.

This was the governing factor in a number of existing projects. As oil companies continue to assume the responsibility for controlling the release of hydrogen sulfide and sulfur dioxide, they may be expected to install additional recovery units, particularly in those refineries in congested areas.

Growing requirements.—As the oil industry continues to diversify its operations, it will increase its demand for sulfur.

Oil's entry into petrochemicals has been attended in many cases by new sulfur requirements. Expanding alkylation operations also are causing many refiners to investigate means of becoming more self-sufficient in sulfuric acid.

Future trends.—In the present sulfur search, the larger and more economic sources of hydrogen sulfide in the oil industry are rapidly becoming committed by oil companies, themselves, and by chemical companies through partnerships or purchase contracts.

Prospective acid and sulfur manufacturers seeking untapped petroleum sources say the cream has largely been skimmed off. This indicates that new plant construction following the present period of negotiating and contracting will continue at a high rate for another year or two. But the peak of the boom is expected soon, as the best available sources are absorbed.

A continued growth in petroleum sulfur recovery is expected to follow this present boom, but on a lower, more cautious level.

If the analysts are correct in predicting a second shortage of cheap sulfur even greater than the present one within the next 5 to 10 years, construction of new petroleum-sulfur projects will then resume at a higher level, with special attention given the smaller, more remote sources which are now considered marginal.

A government spokesman has estimated that sulfur production from petroleum sources will increase fourfold over 1951 recovery within the next decade. This estimate is considered high by some industry analysts who predicate their studies on conservative estimates of future plant economics.

PIPE LINERS MEET.—Grouped here are 12 of the 500 pipe-line men who attended the annual Pipe Line Contractors Association meeting in Houston. Left to right, standing, are E. G. Morrison, Western Pipeline Contractors, Inc.; T. A. Hester, Oklahoma Contracting Co., director; Ray L. Smith, Ray L. Smith & Son, Inc., director; N. A. Saigh, N. A. Saigh Co., Inc.; M. S. Williams, Anderson Bros. Corp., vice president; H. C. Price, H. C. Price Co., director; Clark C. Bledsoe, Midwestern Constructors, Inc., treasurer; Richard A. Gump, executive secretary. Seated are E. J. Mahoney, Jr., Mahoney Contracting Co.; Robert A. Conyes, Conyes Construction Co., vice president; Lawrence H. Favrot, Houston Contracting Co., retiring president; and Robert Thomas, Texas Louisiana Contractors. The pipe liners were agreed that 1952 will be another big year in oil and product-line construction.

Big Pipe-Line Year

Oil trunk-line construction to reach new peak in 1952, contractors believe; race in big-inch gas lines is over

Paul Reed

HOUSTON. — Contractors are preparing for another big construction year—one which will see the largest trunk-line building program.

This was apparent at the fourth annual convention of the Pipe Line Contractors Association, held here last week at the Shamrock Hotel.

The five major crude-oil lines which will get under way in the United States and Canada during 1952 will constitute more extensive operations than similar projects in any previous period.

In addition, products-line programs now under way and contemplated entail more than 4,000 miles of pipe, including projects not yet officially announced.

The growing demand for natural gas for domestic, commercial, and industrial purposes will require continued building of loops and laterals.

Fewer big gas lines.—The pipe liners were told by Gardiner Symonds, president of Tennessee Gas Transmission Co., that races for franchise territory to build big natural-gas trunk lines in the United States are just about a thing of the past.

The principal trunk-line carriers have been built, Symonds said. Except for the Pacific Northwest, all major areas of the country are now receiving natural-gas service.

However, this does not mean that growth of trunk lines has ended, he said. "They will continue to add capacity in the future, as they have in the past, by construction of additional pipe lines parallel to their existing systems." Growth of transmission lines will depend heavily on the intensity of development of distribution systems and markets in their respective areas.

"All indications are now that there is a considerable unsatisfied demand for gas at present prices. Much of this demand probably will continue after arrival of higher gas prices which have been made necessary by increased costs."

In regard to gas-line construction this year, Symonds predicted that a substantial amount of pipe will be laid though not as much as in 1951.

More oil lines.—Top priority during the year will be given to construction of crude and products lines considered essential to defense—this at the expense of proposed gas lines, if necessary.

Steel alloted by the Petroleum Administration for Defense for natural-gas lines was about 10 per cent less for the last quarter of 1951 than for the third quarter, and PAD officials have warned that gas will be cut back still further in 1952, Symonds said. First-quarter allotments carried out this policy, with 295,510 tons of steel granted 10 large crude lines.

"Both need and opportunity exist for oil pipe-line growth. There are many oil fields which either have no pipe lines or which have inadequate pipe-line capacity—some with flush production. Likewise, the demand for gasoline and various other petroleum products has grown in various areas to a volume which will support and justify the investment in products lines of large diameter and capacity."

Equipment coming. — Pipe-line contractors can expect to receive more heavy-construction equipment in 1952 than they did last year, if there is no substantial change in the world situation.

Harmon S. Eberhard, executive vice president of Caterpillar Tractor Co., told the association that two major factors will start a greater flow of product to essential civilian customers during the coming months.

They are: (1) An improved materials situation which should allow Caterpillar to produce more nearly at capacity throughout the year, and (2) an outlook for a substantial decrease in government orders during the period. The fourth quarter of 1951, he

said, saw Caterpillar ship 25 per cent more of urgently needed parts than it did in any other 3 months of the year.

Uniformity trend.—Greater uniformity in specifications and a better understanding of their practical essentials of construction were emphasized by J. C. Sterling, manager of authorizations, Service Pipe Line Co., Tulsa.

While complete standardization would not be feasible because of the various needs of different companies, there will be advantages in shorter and more concise specifications, he said. The basic need is for good construction. The contractor should be free to exercise his judgment in meeting the standards set by the company.

Good pipe laid with good field welding will not pull in two, said Sterling, who asserted that the practice of putting slack in the ditch is a bugaboo which has come down from the dark ages of the screw-pipe area. Temperature must drop from 110° F. above zero to 109° F. below zero before reaching the elastic limits of 40,000-lb. tensile strength pipe. In steel lines with 3 ft. of cover, temperature changes in Illinois have not been observed to be more than 40° F. In Colorado and Wyoming with 18-in. cover, temperature changes of pipe have not been more than 58° F. when atmospheric changes were as much as 86° F.

Cradling the pipe into the ditch directly behind the dope machine is a practice which has been successfully applied by Service Pipe Line Co. Elimination of handling operations reduces the chances for damaging the coating.

New officers.—A. I. Forbes, Associated Pipeline Contractors, Inc., Houston, was elected president of the association succeeding Laurence H. Favrot, Houston Contracting Co., Houston. Robert A. Conyes, Conyes Construction Co., San Pablo, Calif., was re-elected vice president.

Other officers include: Maurice S. Williams, Anderson Bros. Corp., Houston, vice president; Clark C. Bledsoe, Midwestern Constructors, Inc., Tulsa, treasurer; and Richard A. Gump, Dallas, reappointed executive secretary.

New directors who will serve for 2 years are: Felix M. Johnson, Trojan Construction Co., Inc., Oklahoma City; Robert D. Sheehan, Sheehan Pipeline Construction Co., Tulsa; R. H. Fulton, R. H. Fulton & Co., Lubbock, Tex.; and J. C. Britton, Britton Contracting Co., Inc., Washington, Pa. Conyes will serve a 2-year term as director also.

Directors held over for 1-year terms include Bledsoe, Williams, T. A. Hester, Oklahoma Contracting Co., Dallas; Ray L. Smith, Ray L. Smith & Son, Inc., El Dorado, Kans.; and Harold C. Price, H. C. Price Co., Bartlesville, Okla.

Strike Closes Refinery

NEW YORK.—A strike of approximately 1,800 unionized employes this week brought operations to a complete halt at the 80,000-bbl. daily refinery of Tide Water Associated Oil Co. at Bayonne, N. J.

There appeared to be no immediate prospects of a settlement. Officials of the Federal Mediation Service sought to bring the two sides together in a meeting later this week.

Tide Water said the strike was "unfortunate, unnecessary, and unjustified." The union involved is the Tide Water workers' own Employes Association, Inc.

Tide Water said it was originally presented with 67 demands involving welfare plans, overtime, the closed shop and other items. It said the union turned down an offer of a 3.4 per cent wage increase and concentrated on the nonwage issues.

Picket lines were established around the plant, including the nearby tank farm. The union gave notice of the strike January 4. Maintenance crews shut down the units over the week end, and by 8 a. m. January 7, the entire plant was idle.

K. C. HEALD

Powers Award Winner

K. C. Heald, vice president of Gulf Oil Corp., Pittsburgh, has been named to receive the Sidney Powers Memorial Medal of the American Association of Petroleum Geologists.

The gold medal, highest honor awarded in petroleum geology, will be presented at the annual meeting of the A.A.P.G. in Los Angeles March 25.

Frank Morgan, A.A.P.G. president, said the selection of Heald for the award was made on the basis of his "long and outstanding service and contributions in petroleum geology, and for his leadership in research bearing on the important problem of the origin of oil."

Heald is a charter member of A.A.P.G. and was its fourteenth president. He was editor of its monthly publication 31 years. He has been associated with Gulf Oil Corp. since 1925.

Only five other petroleum geologists have received the medal. They are Wallace E. Pratt, 1945; Alexander Deussen, 1947; A. I. Levorsen, 1948; E. De Golyer, 1950; and Max Steineke, 1951.

Mazda Oil Corp. Sold

NEW YORK.—National Phoenix Industries, Inc. of New York City has completed arrangements to acquire Mazda Oil Corp., Tulsa.

National Phoenix has contracted to acquire approximately 96 per cent of the common stock and 88 per cent of the preferred stock of Mazda previously owned by Julius Livingston of Tulsa, Mazda president. Payment will be made part in cash and part in stock of the purchaser.

The purchaser, an investment firm, was known as Phoenix Industries, Inc., prior to its acquisition of National Power & Light Co., a utility formerly owned by Electric Bond & Share Co.

Mazda, founded by Livingston in 1923, is an oil and gas producing company with an interest in 106 producing oil and gas wells in Oklahoma, Kansas, and Texas. In addition, Mazda owns 27,000 acres of nonproducing leases lying principally in Texas, Oklahoma, and Kansas.

Guidinger Honored

BARTLESVILLE, Okla.—More than 200 oil men from all parts of the Southwest joined with Phillips Petroleum Co. here January 9 in paying tribute to Edward R. Guidinger, who has retired from the Phillips organization after 26 years of continuous service.

Guidinger became widely known in the petroleum industry while serving as manager of crude-oil sales and pipe lines for the Phillips company starting in 1932. Among the guests from other companies were those who had carried on business dealings with the honoree over a period of years involving the sale or purchases of millions of barrels of crude oil throughout the Southwest.

Recently Guidinger has been manager of crude-oil pipe lines and consultant to C. R. Musgrave, vice president of the Phillips company who presided as toastmaster at the banquet. Among the speakers paying tribute to Guidinger was K. S. Adams, chairman of the board, and Paul Endacott, president of the Phillips company, and Ralph Dietler, chairman of the board of the Stanolind Oil Purchasing Co., Tulsa.

SOUTHWEST

Pessimism in Texas

Flood of foreign oil in 1952-53 to create new problems for Texas' domestic oil producers, Culberson predicts

AUSTIN.—The domestic oil producer in Texas faces a tough job if he intends to stay in business in 1952-53.

This is the opinion of Olin Culberson, chairman of the Texas Railroad Commission, who contends that a flood of foreign oil, beginning to be available by late 1952 and early 1953, will materially cut into our domestic demand.

While the petroleum industry has enjoyed phenomenal prosperity as well as growth the past year, he said, and although those who attempt to predict future demands have prophesied greatly increased need of additional production, there are factors which must be seriously considered which, especially in Texas' case, might affect the domestic oil picture of the United States. These are:

1. The Government, through Petroleum Administration for Defense, anticipates an increase in oil imports to a total of 931,000 bbl. daily for 1952.

2. PAD expects a reduction of exports of United States oil of 117,000 bbl. daily.

3. Only a 4 per cent increase in the drilling program in the United States in anticipated this year.

4. There is an indicated increase of 100 per cent in the Middle East, 250 per cent in Venezuela, 120 per cent in Mexico, and 50 per cent in Canada.

5. A tremendous program of building oil tankers is already being accomplished.

Texas makes gains.—Culberson reviewed oil operations in Texas during 1951, which showed material gains in all activities.

A total of 10,834 oil wells were completed, compared with 10,660 for 1950. There were 881 gas wells completed, compared with 739 a year ago; 5,918 dry holes were drilled compared with 4,576 a year ago; and 4,017 wildcats were drilled in 1951 compared with 3,070 for 1950, of which 540 were wildcat oil wells and 120 wildcat gas wells. During 1951, he said, 5,871 dry holes were plugged, compared with 4,577 in 1950.

A total of 978,010,080 bbl. of oil was produced in Texas during 1951, Culberson reported, adding that this figure was an estimate because operators have until January 15 to file their December production reports. During 1950 817,842,380 bbl. of oil was produced.

There were 132,467 producing oil wells at the end of the year, compared with 125,165 in December 1950; 167 gasoline plants compared with 163 a year ago; 34 recycling plants compared with 33 a year ago; 152 pressure-maintenance and repressuring projects compared with 147 a year ago.

Gas production.—Total sweet gas produced was 2,756,539,178,000 cu. ft., compared with 3,075,317,700,000 cu. ft. a year ago; 343,066,918,000 cu. ft. of sour gas was produced compared with 352,968,048,000 cu. ft. in 1950; and casing-head gas totaled 924,570,897,000 cu. ft. in 1951 compared with 1,137,087,984,000 cu. ft. in 1950.

Other figures released by Culberson showed that there was a total hydrocarbon - liquids production of 115,725,128 bbl. compared with 128,348,004 bbl. a year ago; 37 carbon-black plants compared with 33 a year ago; and 683,988,318 lb. of carbon black produced in 1951 compared with 723,971,508 lb. a year ago.

A total of 717,184,832 bbl. of crude and products were run in refineries in 1951, compared with 611,783,457 bbl. a year ago. Products manufactured totaled 687,188,659 bbl. in 1951, compared with 582,595,702 bbl. in 1950.

CANADA

Winnipeg Refinery

McColl-Frontenac said to be considering new plant

MONTREAL. — McColl - Frontenac Oil Co., Ltd., Canadian subsidiary of The Texas Co., is reported to be planning erection of a $12,000,000 refinery at Winnipeg early this year.

Although G. R. Taylor, vice president, said that plans have not been developed to the stage where the company can comment for publication, it is reported that a site has already been purchased and that construction will get under way early this year.

The refinery would in all probability get its supply of crude from the nearby Interprovincial Pipe Line, which carries Alberta crude to the head of the Great Lakes.

McColl-Frontenac owns three modern refineries, one each at Montreal East, Toronto, and Edmonton, Alta. Capacity of the Montreal East refinery was recently increased from 24,000 bbl. to 40,000 bbl. daily. Throughput of the Edmonton plant is 5,500 bbl. daily. The Toronto facilities, with a capacity of 12,000 bbl. daily, are operating as a lubricant blending and grease plant and marine terminal for refined petroleum products.

In addition to its refining facilities, McColl - Frontenac owns 16 marine terminals, 197 storage warehouses and bulk stations, 466 service stations in the principal cities; and three tank steamers operating on the St. Lawrence River and the Great Lakes. The company has four more under charter.

Large holdings.—During 1950 the firm took part with Texaco Exploration Co. in purchase of crown leases on several parcels of land in Redwater and Leduc fields in Alberta. By the end of that year the firm held working interest in 1,756 acres in Redwater and Leduc, with 35 producing wells completed.

The company also has a 10 per cent royalty interest in net production of Texaco Exploration from six producing wells in the Calmar area.

During 1949 a total of 10,759,346 bbl. of crude was run to its refineries for its own account, plus an additional 1,997,727 bbl. for others. This increased to 11,152,853 bbl. for its own account and 238,728 bbl. for others in 1950.

Other plants. — Winnipeg is already served by two refineries, the Imperial Oil, Ltd., plant at East St. Paul, with a capacity of 10,800 bbl. daily, and the North Star Oil, Ltd., St. Boniface plant, with a capacity of 5,000 bbl. daily.

Another refinery about 100 miles west is the Anglo-Canadian Oils, Ltd., Brandon works, which has a capacity of 2,300 bbl. daily. The only other refinery in the Province of Manitoba is a small 1,000-bbl. daily plant at East Kildonan operated by Radio Oil Refineries, Ltd.

Gas Export Sought

Firm seeks to serve U. S. area, import back to B. C.

NORTHWEST NATURAL GAS CO. has laid before the U. S. Federal Power Commission in Washington for approval an expanded proposal for the exportation of natural gas from Canada into the United States

A portion of the fuel would be distributed in Idaho, Washington, and Oregon, and the remainder brought back into British Columbia.

Cost of the project, including gathering and transmission facilities in Canada, is estimated by the company at $92,000,000.

Northwest, organized in 1946 with a view to establishing an across-the-border gas system, originally filed with FPC in February 1948 for approval of construction of 756 miles of main line, various laterals, and four compressor stations providing a maximum daily capacity of 209,000 M.c.f.

The company's amended application calls for 373 miles of 24-in. line from a point near Eastport, Idaho, to Monroe, Wash.; 79 miles of 18-in. pipe from Monroe to the international boundary near Lynden, Wash.; 29 miles of 22-in. line from Monroe to a point near Seattle; and 164 miles of 2-in. line from Seattle to Portland, Ore., with various lateral lines and four compressor stations with a total of 24,750 hp. Maximum daily delivery capacity of the system would be 285,000 M.c.f.

The expanded transmission system on the United States side of the border would increase the cost from the $38,431,000 estimated in the 1948 application to $50,200,000.

Gas supply.—The company would secure its supply of gas from Pincher Creek, Princess Patricia, Many Islands Lake, and Dunmore fields in Alberta, where it would be gathered by a subsidiary, Alberta Natural Gas Grid, Ltd., and transported to the border by another subsidiary, Alberta Natural Gas Co. The two subsidiaries have an application before the Alberta Petroleum and Natural Gas Conservation Board for permission to export the gas from the province.

The project is designed to serve distributing companies in Spokane, Seattle, Tacoma, Olympia, Bellingham, and Wenatchee, Wash.; Portland, Ore.; Vancouver and Trail, B. C.; and other communities and industrial customers along the route of the pipe line or within economic reach of it, including the Atomic Energy Commission plant at Hanford, Wash.

Imperial Plans Expansion

TORONTO.—Imperial Oil, Ltd., is planning a $24,000,000 expansion and modernization of its refineries at Ioco, B. C., and Regina, Sask.

Fluid catalytic cracking units will be installed at both refineries.

At Ioco, Imperial's expansion and rehabilitation program will increase capacity to 22,500 bbl. daily. Capacity at present is about 12,000 bbl. per day with a thermal cracking capacity of 2,750 bbl. daily.

The modernization work at Regina would increase that refinery's capacity from 20,000 to 25,000 bbl. daily. The refinery now has a thermal cracking capacity of 12,000 bbl. per day, including reforming capacity. Polymer production capacity is 750 bbl. per day.

NATIONAL AFFAIRS

FTC Says: Cartel

Foreign agreements of U. S. oil companies fix prices and curtail competition, says report going to Congress soon

WASHINGTON.—Intercompany arrangements of the American and foreign oil companies engaged in production activities throughout the world and particularly in the Middle East are severely criticized in a report now being prepared for eventual submission to Congress by the staff of the Federal Trade Commission.

A commission official said this week, however, that it will probably be 2 months or more before the report is ready for release.

The commission study, undertaken on its own motion, has been under way for the past year. It has progressed rather slowly because Congress refused to appropriate a special fund for the inquiry when asked by Rep. Clarence Cannon of Missouri to provide $250,000.

Patman echo.—Disclosure that the FTC is preparing the report came on the heels of submission to the House small business committee by Elmer Patman, Austin, Tex., oil attorney, of charges that the American companies are parties to a sinister worldwide cartel which plans to chain the independent domestic producers to the chariot of foreign production *(The Oil and Gas Journal, January 7, page 48)*.

Members of the commission declined to discuss the report, which they said was in the hands of the staff and not yet completed, but reportedly it revives old charges that the American companies are working hand in hand with other companies in the Middle East and Venezuela to fix prices, allocate markets, eliminate the possibility of competition and, in brief, set up a world oil empire.

An old suspicion.—The FTC has been eyeing the international situation for years and statements of members from time to time have made it evident that the arrangements of the American companies between themselves and with foreign companies are subject to suspicion.

This suspicion culminated last February in a resolution to make an investigation and call upon the companies operating abroad to submit their records for inspection. The first call was on Standard Oil Co. (N.J.), Gulf Oil Corp., and Socony-Vacuum Oil Co., but other companies with foreign interests also were asked to furnish information.

In its resolution, the commission pointed out that the oil industry is one of the largest and most important industries in the United States, highly concentrated, with the preponderance of total assets, proved reserves, crude production, and refining capacity held by a relatively few large companies.

Restraint of trade.—Also, it said, "it is reported in authenticated, secondary sources that over a long period of years American petroleum companies operating in foreign countries have entered into restrictive agreements among themselves and with petroleum companies of other nations, many of these agreements having reportedly been recently extended and reinforced."

Such agreements, the commission held, are reported also to have had the effect of restraining trade and of affecting prices of crude and products in the United States.

The investigation was to cover the "agreements entered into by American petroleum companies among themselves and with petroleum companies of other nations in connection with foreign operations and with international trade in petroleum and petroleum products and of the relationship of such agreements to domestic trade in and pricing practices of the American petroleum industry."

Wants Tax Laws Tightened

WASHINGTON. — President Truman is expected again to ask Congress this week for a tightening up of the tax laws, including the depletion allowance for oil and gas, with or without another tax increase.

The President sidestepped the subject in his annual message to Congress, saying merely that high taxes will continue "over the next few years" and that he will discuss the

matter more fully in his budget message, now expected to be transmitted January 21.

Facing a tempestuous session in which every member will keep his eye on the upcoming presidential campaign, Truman called for a moratorium on politics but at the same time again insisted on his "Fair Deal" program.

As he did last year, the President laid down 10 points on which he wants legislation, but most of them were of a beneficial character—health, education, social security, etc.—and only 3 were industrially important—development of natural resources and extension of power facilities, expanded highway construction, and revision of the Taft-Hartley Act.

Steel Supply Assured

Enough will be available for 45,000 new wells, plus big refinery expansion; nondefense supplies to be cut

WASHINGTON. — The oil industry this year will get sufficient steel to carry out its 45,000-well program and go ahead, although probably at less than the hoped-for rate, with the project to add 1,000,000 bbl. daily to its refining capacity by the end of 1953.

There appears to be little chance, however, of any great expansion of natural-gas service during the coming year, although new pipe-line projects can be set up as the lines now under construction are completed.

The pinch on materials, which will necessitate substantial cutbacks in the production of civilian consumer goods, will run through all of 1952 and probably continue into 1953, and 3 years of heavy spending and concentration on rearmament are in sight.

These, from the standpoint of the oil and gas industry, were the highlights of a report on the first full year of the defense program submitted to President Truman by Mobilization Director Charles E. Wilson.

"Expansion of oil and gas-industry facilities has been necessary both to meet current civilian and military requirements and to prepare reserve capacity adequate to meet an all-out emergency in the future," Wilson reported. "We are aiming to increase refining capacity from 7,000,000 bbl. a day to 8,000,000 bbl. a day by the end of 1953.

Drilling "vital."—"Goals for expansion of productive capacity for crude oil and transportation and storage facilities—each balanced with the projected refinery expansion program—have been developed. One of the most vital of these allied expansions is the oil-well drilling program. For 1952 it is planned to drill 45,000 wells—1,100 more than the 1951 goal."

Wilson told the President that the current-quarter allotment of materials for expansion of crude production will permit expansion of oil-well drilling at the scheduled rate. Allocations also will support "substantially, but not fully," the desired rate of expansion for refining, transportation, and storage facilities. But in the case of natural gas, a shortage of plate for large-diameter line pipe compels the deferment of a substantial part of the projected gas-transmission program.

Pinch to last.—"We cannot now say what the supply of basic materials available to nondefense activities will be beyond the second quarter," Wilson commented. "However, while the supply situation will ease in some basic materials, such as sheet steel, it is unlikely that substantial additional amounts of aluminum and some other steel products will be available to nondefense consumers after the middle of 1952, as we had hoped.

"We now expect the 'pinch' on materials to extend into 1953.

Tank cars.—Wilson disclosed that current allotments of controlled materials will support the construction of 2,000 tank cars, but he hinted at an increase in the existing car shortage this year because of increasing car requirements for oil and the influence of competing demands for materials in restricting new-car production.

The report also noted that marked increase in demand for petroleum have necessitated expansion in the nation's pipe lines and oil terminal facilities.

"Because of other demands for plate steel, however," Wilson explained, "availability of line pipe for use in the construction of petroleum pipe lines during most of 1951 was somewhat less than the industry used in 1950. Some of the more important projects are not now expected to come into operation before the third and fourth quarters of 1952."

Steel Allotment May Be Cut

WASHINGTON. — Second - quarter steel allocations for the oil and gas industry may be slightly less than for the current period.

Testifying before the joint congressional committee on defense production, Defense Production Administrator Manly Fleischmann said the allotments to the industry will support the oil and gas production, refining, marketing and oil-field machinery programs at comparatively high levels but "some of the proposed construction of gas-transmission lines, and some of the proposed new oil pipe lines may have to be deferred because of the limitations of our steel-plate supply."

Fleischmann said that structural forms and plate are the steel items in shortest supply, a situation which has necessitated cutting the railroad-car building program in half, but the reduction will not affect plans to produce 2,000 tank cars monthly.

Despite short supply, however, Fleischmann disclosed, the tanker-construction program is to be stepped up and materials have been authorized to continue construction of vessels which receive material in this quarter and to initiate further tanker construction.

The full impact of the military program will be felt by the civilian economy in the second quarter, which will be one of the most difficult in the whole defense effort, Fleischmann warned.

More Wire Rope

PAD sees increased supply as result of NPA's order

WASHINGTON.—Increased supplies of wire rope for the drilling of oil and gas wells are foreseen by Deputy Administrator Bruce K. Brown as a result of action by the National Production Authority placing it under the Controlled Materials Plan January 1.

NPA's action, Brown said, should alleviate any fears of operators of a shortage of rope. Formerly classified as a B product, it was made a controlled material not because of any shortage of the large-diameter line 1 in. and over used in drilling operations but because small-diameter rope, little used by the industry, is in relatively tight supply.

Brown pointed out that the M-46A order makes mandatory the distribution of wire rope through regular distributors of at least 100 per cent of the shipments during the base period, January 1-September 30, 1950.

"If there is any demand for more than this minimum, production will simply be increased," Brown said. "The necessary mill capacity is waiting and ready."

No allotment needed.—The order will not require operators to secure allotment certificates to procure rope for drilling. Distributors will be permitted to sell with or without allotment certifications and it is only the producing mills that will require documentation of orders.

"We in PAD are certain that there will be at least as much large-diameter wire rope available in the first

quarter of 1952 as there was in the last quarter of 1951," Brown said, "and the methods for getting the rope will not be changed at all.

"Some operators have said they feared the order would make it necessary for them to maintain large stocks of rope on hand to meet emergencies. Those fears have no basis in fact. They can maintain their usual procedures without any slightest danger of being caught short."

No Foreign Favors

Bruce Brown assures I.P.A.A. counsel PAD will not favor foreign operations at the expense of domestic

WASHINGTON. — Independent domestic oil producers have been assured by Deputy Petroleum Administrator Bruce K. Brown that PAD will not favor foreign operations at the expense of domestic.

Brown gave his promise in a letter to Russell B. Brown, general counsel of the Independent Petroleum Association of America, who had protested PAD's plans for foreign operations in 1952 as announced last month (*The Oil and Gas Journal, December 13, 1951, page 61*), expressing apprehension that stepped-up foreign-drilling program might mean less steel, less activity, and less oil capacity in this country.

The I.P.A.A. counsel also referred to the fact that PAD anticipates an increase in imports from 903,000 bbl. daily in 1951 to 931,000 bbl. daily this year, and a cut in exports from 357,000 to 240,000 bbl. daily, resulting in an increase of net imports from 546,000 to 691,000 bbl. a day.

In view of these facts, Russell Brown, intimated the independent producers were concerned over whether PAD was carrying out the principles of the national oil policy of the National Petroleum Council.

In his response, Bruce Brown emphasized that national oil policy must be considered in connection with official government actions such as the North Atlantic Treaty and the Agreement for Economic Cooperation between the United States and Canada.

"I refer to these documents merely as two illustrations, out of many, indicating that the policy of our Government is to achieve national security in part by achieving security throughout the free world," he said. "Actions taken to assist in sustaining and augmenting the supply of oil available to friendly foreign nations seem to me to be not only justifiable under the circumstances but also in accord with the national oil policy to which you referred."

Responsibility world-wide.—PAD's responsibility is world-wide, Bruce Brown pointed out, but, he added, "Despite our global responsibilities, the record shows that we have in no wise lost sight of our obligations to the domestic industry or of the primary dependency on the availability of domestic supplies to meet our national petroleum needs."

Our defense requirements, the PAD head explained, must take into account not only the primary objective of vigorous and healthy domestic industry and the building up of adequate reserve capacity in the United States but also the military and economic stability of friendly foreign nations on which we are in many ways dependent in the present emergency. It is a problem requiring a "difficult exercise of sound judgment," he admitted.

"Proper perspective." — "In carrying out its responsibility," he told the I.P.A.A., "PAD has endeavored to maintain a proper perspective as to the defense needs of this country, and has balanced operations within the United States, the Western Hemisphere, and the Eastern Hemisphere to achieve this end. This is the policy on which our 1952 projected programs —domestic and foreign — have been based. We do not feel that we have favored foreign operations at the expense of domestic nor that there is any real or apparent disproportionate emphasis on the foreign drilling operations."

Demand to Rise

Chapman thinks 1952 gains won't match those of 1951

WASHINGTON.—Interior Secretary Oscar Chapman expects a substantial increase in the demand for petroleum during 1952. He believes, though, that the increase won't be as great as that shown in the year just ended.

Reviewing 1951 mineral production and looking into the future, Chapman found that last year demand was nearly 10 per cent greater than in 1950 but foresaw that this year the increase will be at a probable rate of 5 per cent.

However, the secretary added, "even this moderate increase will require further expansion of the industry's capacity, in order to maintain a reasonable margin over current demand."

Domestic crude production last year approximately 2,250,000,000 bbl., an increase of 14 per cent over 1950, Chapman estimated. The 1951 demand was 2,725,000,000 bbl., the increase over the preceding year coming from an 8 per cent increase in domestic demand and a 40 per cent rise in exports to 156,000,000 bbl. The increase in exports result in part from the shutting off of Iranian oil.

Preliminary estimates indicate that the oil industry drilled 44,000 wells and expanded its transportation and refining facilities materially, and Chapman noted that this was accomplished with only a small increase of about 5 per cent in the prices of petroleum and products compared with the 1950 average—much less than the rise in prices in the extractive industries generally.

Production of natural gas continued at the sharp upward curve of recent years, gaining 15 per cent over 1950.

New Faces at PAD

Key men appointed under agency's rotation system

WASHINGTON.—New men drawn from the oil and gas industry are beginning to show up at the Petroleum Administration for Defense as its rotation system gets under way.

Under the plan developed by Deputy Administrator Bruce K. Brown to ask men to serve in key posts for a brief training period and 1 year thereafter, many of those who came in during the formative stages of the organization are nearing the close of their enlistment and a considerable turnover will occur during the next few months.

In addition to Robert L. Foree of Youngblood & Foree and Central Well Servicing Co., Dallas, who succeeded Richard G. Lawton as director of the production division when the latter returned to the Lawton Oil Corp., Magnolia, Ark., of which he is president, two other key men have been replaced since the turn of the year.

Refiner named. — Maurice F. Granville, Woodbury, N. J., assistant superintendent in charge of operations at the Eagle Point refinery of The Texas Co., has been named assistant director of the refining division, without compensation, succeeding Thomas L. Apjohn, who joined PAD in October 1950 and is returning to Socony-Vacuum Oil Co., Inc.

Gerald L. Glespen, Oradell, N. J., technical supervisor in the chemicals department of American Cyanamid Co., has been appointed chief of the chemicals, containers, and packaging branch of the materials division, without compensation, succeeding Theodore H. Herman, Jr., who joined PAD in January 1951 and will remain for a time as a consultant.

PAD also announced the appointment of Albert F. Lager, Terre Haute, Ind., petroleum attache at the U. S. Embassy at Cairo since January 1950, assistant director of the foreign production division.

WATCHING WASHINGTON

Bertram F. Linz

Hot Potato

Sometime in the near future President Truman will have to reach a decision which may fan into hot flame the never totally extinguished congressional feud over the Natural Gas Act.

On the face of it the President merely has to nominate a man for a government job and presidential nominations usually receive Senate confirmation, only 2 of more than 26,000 nominations made last year having been flatly rejected. But in this case, the job happens to be membership on the Federal Power Commission, which regulates the natural-gas industry, and natural gas is a burning subject in Congress.

The job to be filled is that vacated last October 1 by Mon C. Wallgren, long-time friend of the President, who quit for personal reasons. Wallgren, who had been turned down by the Senate as chairman of the National Security Resources Board, succeeded Leland S. Olds, whose reappointment after 10 years of service was turned down by the Senate 2 years ago.

Nominations to the FPC must stand up under the scrutiny of the Senate interstate commerce commitee, whose 13 members have considerable knowledge of the gas industry and, like the Senate as a whole, are stronger supporters of free enterprise than of strict government regulation. It was on this issue that the Senate rejected the Olds' nomination by a vote of 53 to 15.

Olds was an ardent advocate of public power and when Wallgren was named to succeed him it was expected he would pick up Olds' torch. But on a showdown Wallgren voted with three other members in holding the commission could not regulate the production and gathering of natural gas.

All Is Not Well

Despite the multibillion-dollar defense program all is not well with American industry.

The big fillip which defense production was expected to give industrial output last year did not develop. The index of production, which stood at 221 of the 1935-39 base at the beginning of 1951, was down to 218 at the end of November.

But while production did not increase, unemployment did. An estimated 567,000 workers were laid off from civilian jobs up to the end of last October but only 407,000 of them found places in the defense machine. The total of employment was as great as it had been a year earlier, however, so these 160,000 jobless workers don't show up in the statistics. Most of them were stranded because they had been working in communities where no defense jobs were open.

It is because of the possibilities of greatly increased unemployment that the automobile industry is urging the Government not to cut back automobile production as sharply as planned until displaced workers can be absorbed in defense plants.

Because the workers in all industry constitute the biggest market for the products of each industry, the employment situation is as important to the oil industry as to the manufacturers of shoes, clothing, or any other consumer goods.

New Price Drive

A new drive against traditional industry pricing practices has been launched by the Federal Trade Commission under the Robinson-Patman Act.

First target will be the tire manufacturers who, under a proposed commission rule, could give no greater discount to the buyer of 10 carloads of replacement tires than to the buyer of 1 carload.

Extended to petroleum, and there is no reason to believe it might not be, the commission's rule would mean that the buyer of several tank carloads of oil could get no better discount than the buyer of a single tank car.

In adopting the carload (in the case of tires 20,000 lb.) as the maximum quantity which may be used to justify price differentials, the FTC has followed the rule of the Interstate Commerce Commission which makes the carload the maximum in fixing railroad-freight rates.

It is the position of the commission that discounts based on sales to the largest purchasers discriminate against smaller buyers and tend to promote monopoly. The carload limit, it holds, is the reasonable maximum at which there will be a sufficient number of available purchasers to prevent the discount from being unjustly discriminatory against purchasers in smaller quantities.

Import Quotas Set

Low-tax imports to remain on 1951 basis during 1952

WASHINGTON. — Quotas for foreign-oil imports at the 10½-cent excise-tax rate will continue through 1952 in the same ratio as 1951.

This means that Venezuela will get 59.4 per cent of the total quota, the Netherlands West Indies will have 18.7, and all other countries will have 21.9 per cent.

The 10½-cent per barrel rate is provided for in the reciprocal trade agreement with Venezuela.

While the quota will remain unchanged—5 per cent of the crude processed last year in the continental United States—the volume of cut-tax imports is expected to be somewhat above the 104,743,350 bbl. allowed entry in 1951.

The import quotas provided for in the 1939 trade agreement with Venezuela, later superseded by general extension of the reduced tax to all imports under the 1942 agreement with Mexico, were restored to effect January 1, 1951, as a result of the abrogation of the Mexican agreement.

With a substantial share of its oil exports to the United States subjected to the full tax of 21 cents per barrel (its quota of 62,217,550 bbl. was filled by the end of June), the Venezuelan Government last year sought and secured consideration of a new trade agreement with a view to wiping out the quota system.

Hearings were held by the Tariff Commission and Committee for Reciprocity Information last October at which domestic producers and importers were given an opportunity to present their views, since which time the agreement has been in the discussion stage.

Marketers' Needs Sought

WASHINGTON. — Petroleum marketers and distributors are being asked by the Petroleum Administration for Defense to submit their programed requirements for critical materials as far in advance as possible of the time they will need them.

While producers and refiners are accustomed to making plans on a long-range basis, Deputy Administrator Bruce K. Brown said, the marketers and distributors normally do not make plans very far in advance of needs for the supply, storage, and movement of oil.

"If we are to meet the storage and supply and transportation needs of the marketers and distributors, we must know the needs well enough in advance so that we can intelligently plan for them in our requests for allocations of materials from the Defense Production Administration and in our own allotments of the materials we are granted."

General plant area at Kirkuk, showing stabilizer unit in foreground.

Kirkuk Expanding

Iraq area under intensive development to provide new facilities needed for I.P.C.'s big-inch line to Banias

Presented here is the final feature by Dahl M. Duff, the Journal's international editor, written during his recent extensive tour of petroleum operations in the Middle East. The first article appeared in the October 11, 1951, issue.

Dahl M. Duff

CONSIDERABLE activity is now taking place in Kirkuk in Iraq to provide the enlarged field facilities necessary for the new 30 and 32-in. pipe-line outlet to the Mediterranean *(The Oil and Gas Journal, January 7, 1952, page 52)*.

Wells, separators, field lines, stabilizers, and tankage are all being added to in varying extent. This program will enable Kirkuk to meet the approximately 300,000 bbl. daily additional requirement for the new line.

Kirkuk, discovered in 1927, is one of the largest oil reservoirs in the Middle East, but its inland location limits production to the capacity of the long-distance pipe lines to the Mediterranean Coast. The present 12 and 16-in. to Tripoli, Lebanon, allow a current production of around 170,000 bbl. daily.

The new 30 and 32-in. which the operators, Iraq Petroleum Co., Ltd., are now building from Kirkuk to Banias, Syria, is scheduled to begin initial deliveries in April. Pipe-line throughput will be stepped up through the remainder of 1952, and by the early part of 1953, the field will be producing close to a half million barrels daily.

The new line thus will necessitate a nearly two-fold expansion of the field's output. In addition, there is the possibility that the political situation could improve sufficiently to allow the reopening of the now-closed 12 and 16-in. lines to Haifa, Israel. These have a capacity to move an additional 120,000 bbl. daily.

Big output.—Kirkuk was first commercially produced in 1934, and cumulative output this year passed the half-billion-barrel mark. All this oil has been withdrawn from the Baba area which is one of three domes on the structure. In view of the requirements of the new pipe line, preparations are now being made to begin production from a second dome the latter part of next year.

This is the Avanah area which occupies the central portion of the structure. Eleven wells were drilled in this section in 1948-49. Construction work is now under way on two degassing stations as well as a 20-mile, 24-in. main delivery line to the stabilizer plant area.

The Avanah dome occupies about 20 miles of the central section of the Kirkuk structure. Altogether, the northwest-southeast Kirkuk anticline is about 63 miles long and an average of 2 miles in width. The Baba area on the southeast is about 31 miles long. The third smaller dome on the northwest is Khurmala, about 12 miles long.

Baba the mainstay.—Baba, on which the famous Kirkuk discovery well, Baba Gugur 1, was drilled, will continue to be the mainstay of the field's production even after the Avanah facilities go into operation. The plan is to draw about 300,000 bbl. daily from Baba, and about 200,000 bbl. daily from Avanah.

Kirkuk produces from the Quarah Chauq limestone of Miocene and Eocene age at depths of from 950 to 3,200 ft. It is a low-pressure operation (flowing surface pressure of about 150 psi.), and the highly fractured nature of the limestone gives rise to an unusual degree of intercommunication between the sections of the entire reservoir. The Baba dome production during the last 17 years has been draining the Avanah area, but it is felt that better balanced withdrawals will be possible at next year's higher rate by producing from both Avanah and Baba.

The Lesser Zab River cuts across the Kirkuk structure between the Baba and Avanah areas. The new Avanah facilities are to the north of the river, and as a necessary part of the program to begin producing on this dome, a 1,400-ft. reinforced-concrete bridge is under construction. It is now about 30 per cent completed, and is due to be ready for use by November of this year. The bridge also will carry the new 24-in. delivery line from Avanah. A ferry and a Blondin cableway are now the principal means of crossing the river.

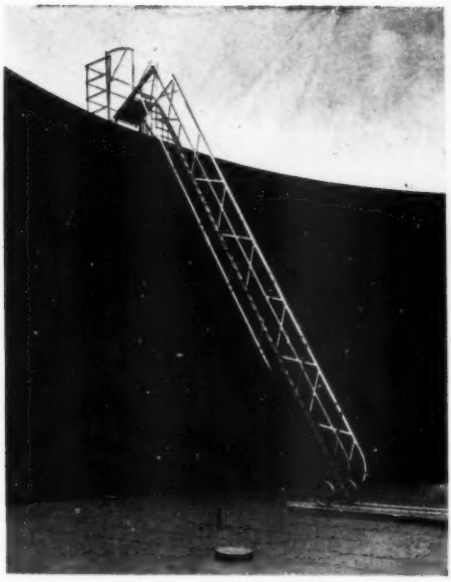
Degassing stations.—In the main Baba section of Kirkuk field there are four degassing stations each serving a separate group of wells. During the last year and a half, 10 additional producing wells have been drilled to fill in the Baba area. This dome is now considered to be fully drilled with the total of 33 wells.

Going from south to north, the four Baba degassing stations serve nine, nine, eight, and seven wells.

Unlike other higher-pressure fields in the Middle East which employ inclined separators in multistage arrangements, Kirkuk uses conventional vertical separator columns into which the oil is introduced at about 60 psi. The enlargement work now under way will provide five columns at each of the three south Baba dome stations and four columns at the north station. Work recently started on the construction of the Avanah degassing stations.

Crude from the four Baba degassing stations discharges into 5,000-bbl. Hortonspheres. These provide a second 50-to-60 psi. separation stage, discharging the gas into a ring main extending around the plant area and furnishing fuel for stabilizers, power plant, and topping units. There are three Hortonspheres at present, and a fourth is being erected.

Stabilization system.—Another phase of the Kirkuk operation scheduled to be enlarged is the stabilization system. H_2S is driven off the Kirkuk



These two views show a 118-ft. diam. tank equipped with a Horton Double-Deck Floating Roof. The one above illustrates how the roof floats directly on the liquid.

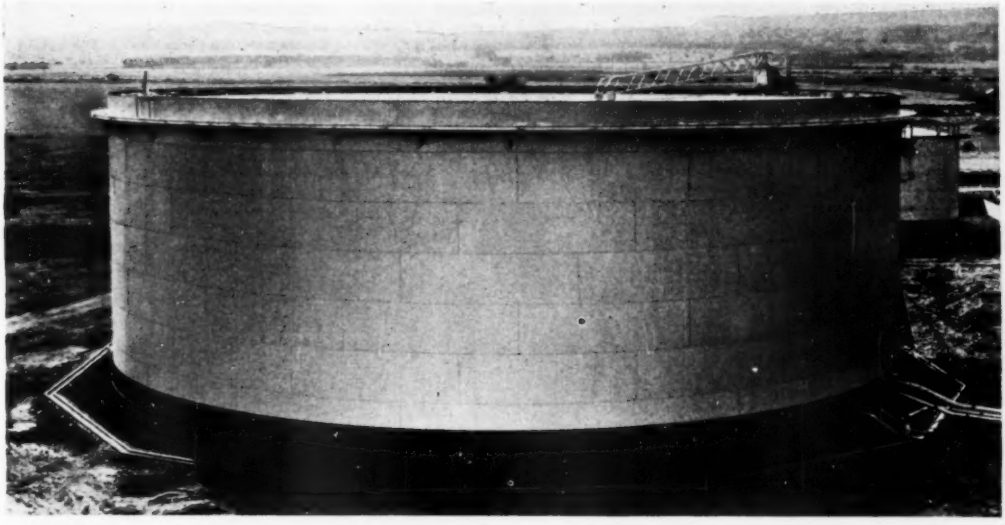
WORKING STORAGE need NOT be COSTLY STORAGE

You're a storage spendthrift if you use a fixed roof on gasoline and crude oil working tanks. Every time you fill that tank, the incoming liquid forces vapors out through the vents. These vapors cause a definite loss that you can't afford to overlook.

The view at the left shows part of a HORTON DOUBLE-DECK FLOATING ROOF. This roof stops filling evaporation losses because (1) it floats directly on the liquid and thereby eliminates the air-vapor mixture that is present in a fixed-roof tank and (2) it is equipped with the Horton seal, the best device ever invented for preventing the escape of vapor around the edge of a floating roof.

By stopping filling losses with a HORTON DOUBLE-DECK FLOATING ROOF, you obviously protect the quantity of the liquid in the tank. Its quality is protected too for the valuable light fractions are the ones most likely to escape if filling losses occur.

How much do these losses amount to? Write for Bulletin B. The figures on evaporation losses from fixed-roof tanks may surprise you.



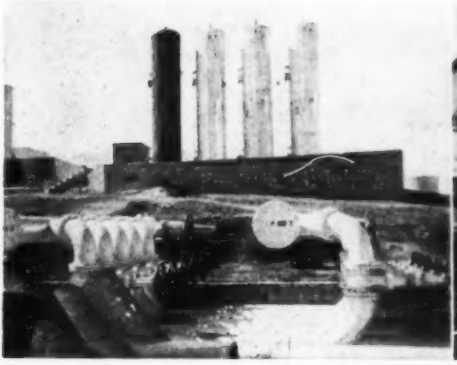
CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Atlanta, 3.....2154 Healey Bldg.
Birmingham, 1.....1536 North 50th St.
Boston, 10.....1025—201 Devonshire St.
Chicago, 4.....2128 McCormick Bldg.
Cleveland, 15.....2204 Guildhall Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Houston, 2.....2119 C & I Life Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3.....1615—1700 Walnut Street Bldg.
Salt Lake City, 4.....525 West 17th South St.
San Francisco, 4.....1554—200 Bush St.
Seattle, 1.....1325 Henry Bldg.
Tulsa, 3.....1606 Hunt Bldg.
Washington 6, D. C.....1139 Cafritz Bldg.

REPRESENTATIVES AND LICENSEES

Horton Steel Works, Limited, Fort Erie, Ontario, Canada
Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Comprimo N.V., Amsterdam—O, Netherlands
Compagnia Tecnica Industrie Petroli, Rome, Italy
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Sociedade Chibridge de Construcoes Ltda., Av. Franklin Roosevelt, 194-S/704-C, Rio de Janeiro, Brazil



Baba degassing station, with new column, left, which has not yet been connected.

Start of present 12 and 16-in. I.P.C. pipe-line system at Kirkuk Station K-1.

crude in two-column stabilizers located in the main plant area. There are now eight of these units, and a ninth is planned for construction beginning about next June and finishing the middle of 1953.

Each of the existing stabilizer units is a self-contained plant. About 95 per cent of the H_2S removal is accomplished in the first column. Overhead is taken through compressors and into the second column to preserve a maximum of light ends.

The projected ninth stabilizer unit at Kirkuk is to be a single-stage operation. At the present time, one of the three original units is being operated as a topping unit to produce fuel oil. Most of the approximately 10,000 bbl. daily of fuel oil produced is moved through one of the existing 12-in. pipe lines from Kirkuk to Station K-2. At K-2, the fuel oil is taken by railroad for distribution in Iraq. Use of the stabilization unit for topping is an expedient made necessary by the shutdown of the Abadan refinery in Iran.

Topping plants.—Kirkuk also has two topping plants. One, of 2,270-bbl. daily capacity, was commissioned last January. A second older unit of about 650 bbl. daily capacity which was built prewar is being continued in service. These units were designed to serve the needs of the company, but their production along with that of the converted stabilizer unit has materially assisted in preventing a products shortage in Iraq since the Abadan shutdown. Marketing continues through the established channels of Rafadain Oil Co.

The Kirkuk crude production, once through the stabilizers, is moved to the tank farm adjacent to the pipeline pumping station. During the last year, a 30-in. transfer line was added from the stabilizer plants to tank farm. There are also four 20-in. transfer lines which were laid earlier, one of which is now in fuel-oil service.

Tankage.—Gross capacity of the tank farm which feeds the K-1 initial pipeline station at Kirkuk is now 1,880,000 bbl. gross. Over the next year six 210,000-bbl. tanks are to be added to provide an additional 1,260,000 bbl. storage. The enlarged tank farm will give the needed flexibility to the field end of the system. The additional tankage has been contracted to Motherwell Bridge Contracting & Trading.

In the I.P.C. organization, the K-1 pump station operates under field control. From K-1 to K-3, there are now two 12-in. and two 16-in. lines, and the 30-32-in. will be laid between these stations next summer. At K-1, the six five-stage pumps are being replaced by six-stage pumps. All pump drive is by electric motor. Kirkuk has the most modern power station in the Middle East. This installation, commissioned in August 1949, has three turbo-alternators with a total capacity of 56,250 kw.

Exploration.—The story of the activities at Kirkuk is not complete without reference to the exploration work now under way. Early last year the company moved in a heavy rig especially to undertake a deep test and investigate formations below the existing limestone producing strata. The well was spudded March 13 and after considerable difficulty penetrated the main limestone. It became the first well to go below the regular Kirkuk producing formation. The equipment is an Oweco steam rig of National 100 design. Coring and testing are being carefully carried out, with a depth objective for the test in the 10,000-ft. range. It is now below 4,600 ft.

Heavy steam rig drilling deep test in Kirkuk field.

The company's drilling program for 1952 contemplates several observation wells as well as exploratory tests in the concession area away from Kirkuk itself. An oil-water observation well is to be drilled on the southeast plunge of the structure, and two others, one for water observation and the other for gas, will be drilled on the northwest plunge on the Khurmala dome. There are now 18 observation wells in Kirkuk in which careful, periodic measurements are made of the oil-water or oil-gas contact.

On the drilling program is a test of the Chemchemal structure roughly 40 miles due east of Kirkuk. A well was drilled in this area in 1929 and obtained gas production. Another exploration well will be at Kor Mor, about 50 miles south-southeast of Kirkuk, where seismograph work is being carried out. Tests drilled here in 1929-30 were unsuccessful but showed good structural indications.

Staff quarters.—On the nonoperating side at Kirkuk, I.P.C. is continuing construction of quarters in its Arrapha Estate for noncovenanted staff personnel. There are now 305 living units in this area which has been laid out to provide 1,200 units. For the covenanted staff, the company has 136 houses for families, and 26 bungalows providing for about 80 bachelors. Dormitories provide for another 30 bachelor staff members. A new airfield which will have 6,000 and 5,000-ft. runways also is under construction by the company at Kirkuk.

Ceremony Set

Zubair starts commercial oil production this week

A CEREMONY to inaugurate start of commercial production from Zubair field of southern Iraq was scheduled to be held this week at the field a short distance west of Basra.

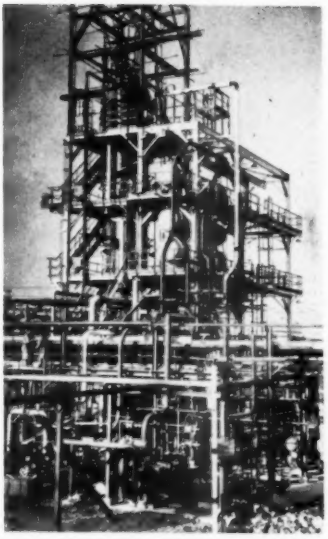
Heading the list of those to attend were Nuri el-Said Pasha, prime minister of Iraq, and H. S. Gibson, managing director of Basra Petroleum Co., Ltd., and Iraq Petroleum Co., Ltd.

Zubair field was discovered in 1948 and is produced at depths from around 11,000 ft. *(The Oil and Gas Journal, December 13, 1951, page 66)*. Basra Petroleum, the operating company which is a member of the I.P.C. group, laid a 72-mile, 12 and 16-in. line from the field to a new tanker terminal at Fao, Iraq, on the Shatt-el-Arab River below Abadan, Iran.

First shipment was made from the terminal December 19. The company estimates that exports this year will amount to about 2,200,000 tons, or about 44,000 bbl. daily. Under the new, not-yet-ratified agreement with the Iraq Government, production at the rate of 8,000,000 tons or about 160,000 bbl. daily is guaranteed by the end of 1955. Present plans are to lay a 24-in. parallel line to Fao, and build additional loading docks.

The commencement of commercial production from Zubair was about 9 months ahead of the deadline date specified in the original B.P.C. concession agreement. In the field thus far, 12 productive wells have been completed, and 5 more are drilling. Total footage drilled amounts to 200,000 ft.

The Zubair crude of 32° gravity is taken by the I.P.C. partners—Shell, Anglo-American, Cie. Francaise des Petroles, and Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc. For Anglo-Iranian, its initial lifting of Zubair crude late in December marked the first time a vessel of the subsidiary British Tanker Co. had loaded in the Shatt-el-Arab since all the company's tankers left Abadan last June as a result of the Iranian nationalization. The British Tanker Co.'s 12,410-ton British Pilot entered the river and took on a load of crude at Fao for delivery to Naples.



DEASPHALTING PLANT.—Latest new unit to go on stream at Port Jerome is the recently completed plant shown here.

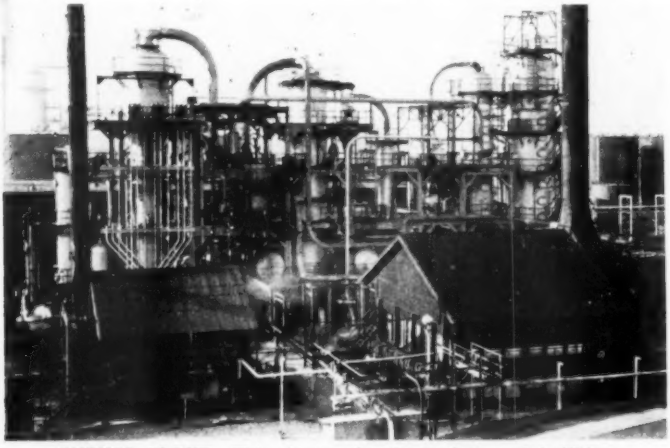
EUROPE

Port Jerome Rebuilding

New propane dewaxing unit, deasphalting plant placed on stream at refinery near Le Havre; expansion is continuing

PLACING of a new propane dewaxing unit and a modern deasphalting plant on stream at Standard Francaise des Petroles' Port Jerome refinery in Normandy marks completion of the first phase of a postwar expansion and modernization program.

Loss of the dewaxing facilities, taken by the Germans during the occupation, dismantling of the vacuum rerun equipment, and bombing of the phenol-treating units left the lube-production possibilities of the refinery greatly reduced at the time of the liberation. Before the war the refinery accounted for about 45 per cent of all lube oils produced in France.



PHENOL PLANT.—This plant replaced war-destroyed facilities.

By combining the undamaged parts of the two prewar phenol-treating units, one operable unit was reconstructed and extracted lube oils were produced from low cold-test crude by December 1946. The phenol unit was expanded and modernized in June 1949 when settlers were replaced by a modern treater tower. This made it possible to make about 135 per cent of the prewar lube production, but quality was limited by necessity of using low-cold-test distillates because of the lack of dewaxing facilities.

Engineering was begun in 1949 on the propane-dewaxing and propane-deasphalting plants required to produce the full line of high-quality paraffinic lube oils. Erection was carried out under general supervision of an American contractor using French labor and subcontractors. Standard Oil Development Co. engineers served as advisors.

Operation of the two units in conjunction with existing phenol-treating, clay-contact, and lube-rerun units will permit Port Jerome to produce a full line of paraffinic distillate and residual-base stocks from Middle East crudes. These will be used for premium motor oils as well as high-grade turbine and marine oils. The plant thus becomes the largest lube-oil refinery in France.

Other construction.—The next step in construction involves modernization of fuel-products facilities. This phase is scheduled for completion early in

1953 and involves a fluid catalytic cracking unit, additional reforming capacity, catalytic cracking feed-preparation unit, compression, light ends, and L.P.G. facilities. S.O.D. is engineering the over-all project.

Maximum realization of quality products from crude will help to meet the requirements of gasoline and light products with a minimum crude run, which is expected to be an important point in the French economy in the future. It will also provide better flexibility in maintaining desired light products fuel ratio and in meeting seasonal variations in products demand.

New features.—Design of the units includes new features of simplification which result in decreased investment and lower operating costs.

Other additions include a new boiler house, expanded power house and expanded shops and maintenance facilities.

Majority interest in the French firm is held by Standard Oil Co. (N.J.), Gulf Oil Corp., and Atlantic Refining Co.

LATIN AMERICA

400-Well Program

Pemex points to 1951 records, announces plans for big drilling program, refining, pipe-line expansion in 1952

FORTIFIED by a record-breaking 1951 income of $207,000,000 from domestic sales and exports of oil, Petroleos Mexicanos will conduct a vigorous campaign this year to drill 400 new wells and build new refining and transportation facilities.

The company's development plans for 1952 were made known by Sen. Antonio J. Bermudez, director general, through his Washington information service.

Aiming at a 1952 revenue of at least $231,000,000, Bermudez said, a definite program for drilling and construction has been laid down, including the following major projects:

1. Construction of four pipe lines to distribute products from the Salamanca refinery: A 76-mile 8-in. line to Lagos, Jalisco; a 122-mile 6-in. line from Lagos to Guadalajara; a 53-mile 6-in. line from Lagos to Aguascalientes, and a 71-mile 4-in. line from Salamanca to Morelia.

2. Completion of the remaining 186-mile section of the 16-in. gas pipe line between Monterrey and Torreon.

3. Construction of a 133-mile 20-in. gas pipe line from Reynosa to Monterrey.

4. Construction of a 118-mile 10-in. pipe line from El Plan field to the new Jose Colomo field.

5. Completion of the rebuilding of the Ciudad Madero refinery, started last year, and rehabilitation of the Minatitlan refinery.

6. Completion, during the current quarter, of new plants for desulfurizing gasoline at the Atzcapotzalco and Ciudad Madero refineries.

7. Construction of a $20,000,000 lubricants plant at the Salamanca refinery with a capacity of 2,000 bbl. a day, for which a contract was signed and equipment and materials ordered in the United States last year.

8. Construction of a $6,000,000 shipyard at the Port of Veracruz for the construction of tankers and major marine repairs.

Reviewing Pemex's 1951 activities, Bermudez said that materials shortages limited operations but a total of 267 wells were drilled as compared to 223 wells in 1950.

As a result of new discoveries, he said, Mexican reserves now total 1,423,900,000 bbl. of crude, 8,850,000 bbl. of distillate, and 1,814,649,090,000 cu. ft. of natural gas, the latter estimated to be equivalent to 362,930,000 bbl. of crude oil.

New fields.—Five new oil fields and 1 gas field were discovered, making a total of 24 new fields brought into production in the last 5 years. The 1951 discoveries were Jose Colomo oil field in the State of Tabasco, considered the most important in many years; Rabon Grande and Concepcion oil fields in the Isthmus zone of Veracruz; Trevino oil field and Lomitas gas field in the northern part of Tamaulipas; and Tamiahua oil field in the north zone of Veracruz.

In addition, Bermudez said, intensified exploration has resulted in locating 120 structures considered highly promising for drilling.

The first shipments of 32°-gravity crude were sent to the United States in December from the new Rabon Grande field under a contract for the export sale of 1,000,000 bbl.

Isthmus line.—Important developments of 1951 reported by Bermudez included completion of the 155-mile pipe line across the Isthmus of Tehuantepec to carry products from the Minatitlan refinery to the West Coast port of Salina Cruz. The line, which cost nearly $3,000,000, has a present capacity of 15,000 bbl. per day which can be doubled by the addition of an intermediate pumping station, and will be converted to crude as soon as one of the new refineries planned for the west coast is built.

Other pipe-line construction included completion of a 25-mile gas line from Monterrey to Cementos Hidalgo, and a 25-mile section of the Monterrey-Torreon gas line.

Gas production.—Natural-gas production in the nine fields developed in the northeastern part of Mexico reached 250,000,000 cu. ft. daily, with additional production from other fields in the central and southern parts of the country.

The last of 6 new tankers with a combined capacity of 380,000 bbl. and 18 smaller vessels were added to the Pemex fleet, and improvements costing $4,850,000 were made during the year. Overland transportation by truck has been expanded to the point where it now accounts for 13 per cent of the total movement, with railroads carrying 87 per cent.

Bermudez reported that a new labor contract made last year gave oil workers $8,300,000 in additional wages and welfare benefits and, in addition, Pemex continued to expand construction of schools, hospitals, medical offices, social buildings, sports fields, highways, the provision of drinking water and electric power for communities, hygiene, and preventive medical programs.

Lube plant important.—From the standpoint of benefit to Mexico's economy, the lubricants plant is the most important. Lube facilities to produce about 1,500 bbl. daily have been under study. About half of the revenue earned by Pemex from the sale of crude and fuel oil is used to pay for imports of lubricants and related products.

It was reported some time ago that Pemex was planning to expand capacity of the Salamanca refinery to 60,000 bbl. daily, but no project of this nature was listed by Bermudez in his review.

Production goal.—No specific production goal for 1952 was set in the Pemex review distributed by the agency's Washington information office. The 1951 daily average of about 210,000 bbl. was somewhat lower than the forecasts made a year ago in Mexico City.

In an interview in Mexico City, Bermudez predicted Pemex production will reach 84,000,000 bbl., or about 230,000 bbl. daily, in 1952. This is the amount which was being produced at the end of 1951.

If the 400 new wells planned are achieved, it will be a 50 per cent increase over the 267 wells drilled in 1951. The original program called for 300 wells in 1941, but the reduction was attributed to both materials shortages and floods which interfered with transportation of equipment in several producing areas which were under water for several months.

A total of 105 rigs are to be used this year, and 44 exploration crews will be maintained in the field in both proven and wildcat areas.

Bermudez in Mexico City coupled

his year-end summary with the announcement of the discovery of the new oil field at Concepcion in Minatitlan township late in December.

Development Contract Signed

Pantepec Oil Co., C.A., and Clint Murchison, Dallas operator, have entered into a contract under which the Murchison interests will develop deep-sand production in Pantepec's part of El Roble field in eastern Venezuela.

The contract was announced this week in New York by Louis W. Storms, Jr., Pantepec president. It provides that Murchison and his associates will drill at their own risk and expense eight wells to the Mercure formations which occur at 10,500 to 12,000 ft.

Pantepec and the Murchison group will develop and operate the field on an even basis after the Murchison investment in the wells has been reimbursed from 75 per cent of the production on a sliding basis. Pantepec will act as operator.

Venezuelan Rigs Increase

Drilling rigs in Venezuela are continuing their slow upward climb. Operators have been cautiously expanding this phase of their activity while production has been maintained at an all-time record.

Latest reports covering December show 106 rigs active in Venezuela. This compares to 98 in March 1951, 90 in November 1950, and 88 in April 1950.

The rigs in operation in December were divided as follows among the operators (figure in parenthesis is the number in operation last March): Creole 16 (13), Shell 31 (29), Mene Grande 30 (25), Atlantic 4 (5), Texas 2 (3), Mercedes 7 (6), Phillips 5 (3), Sinclair 4 (4), Richmond 1 (2), Socony 6 (6), B.C.O. and Pantepec each were operating one rig in March 1951.

NEW LINE IN EUROPE.—One of the first important pipe lines to carry petroleum products in Europe is scheduled to go into service the latter part of this year. It is the 140-mile, 25-cm. (about 10-in.) line connecting the refinery area of the lower Seine with Paris. The line is designed to move about 31,000 bbl. daily of light products into 22 terminals between Colombes and Juvisy in the Paris area. The government, directly and through state-controlled interests, is the majority owner of the line; other shares are held by the refining companies involved. Black products will continue to be shipped by river barge. Shown here is the crossing of the Seine River between St. Denis Island and suburban Argenteuil by a double section of the line (Acme photo).

Gas Line Nears Completion

Another of Argentina's principal producing areas is about to be tied into the 1,000-mile natural-gas pipe line which runs from Comodoro Rivadavia to Buenos Aires.

Now nearing completion is 310 miles of 8-in. extending from Plaza Huincul to a connection with the main Buenos Aires line at General Conesa, south of Bahia Blanca, the midway point on the line.

It is reported that the Huincul line will be able to move about 17,500,000 cu. ft. daily with the installation of compressor equipment. Capacity of the main Buenos Aires line from Comodoro Rivadavia is about 35,000,000 cu. ft. daily. The Argentina Government organization is preparing to award a contract for construction of the compressor station planned at Huincul.

Agar Cross & Co., Ltd., later this winter will complete construction of the main-line intermediate station at General Conesa. This is a single-stage booster station containing four Worthington compressors.

After completion of the Huincul connection and compressor station, further increases in the line's capacity will come with the projected construction later of two more stations north and south of General Conesa.

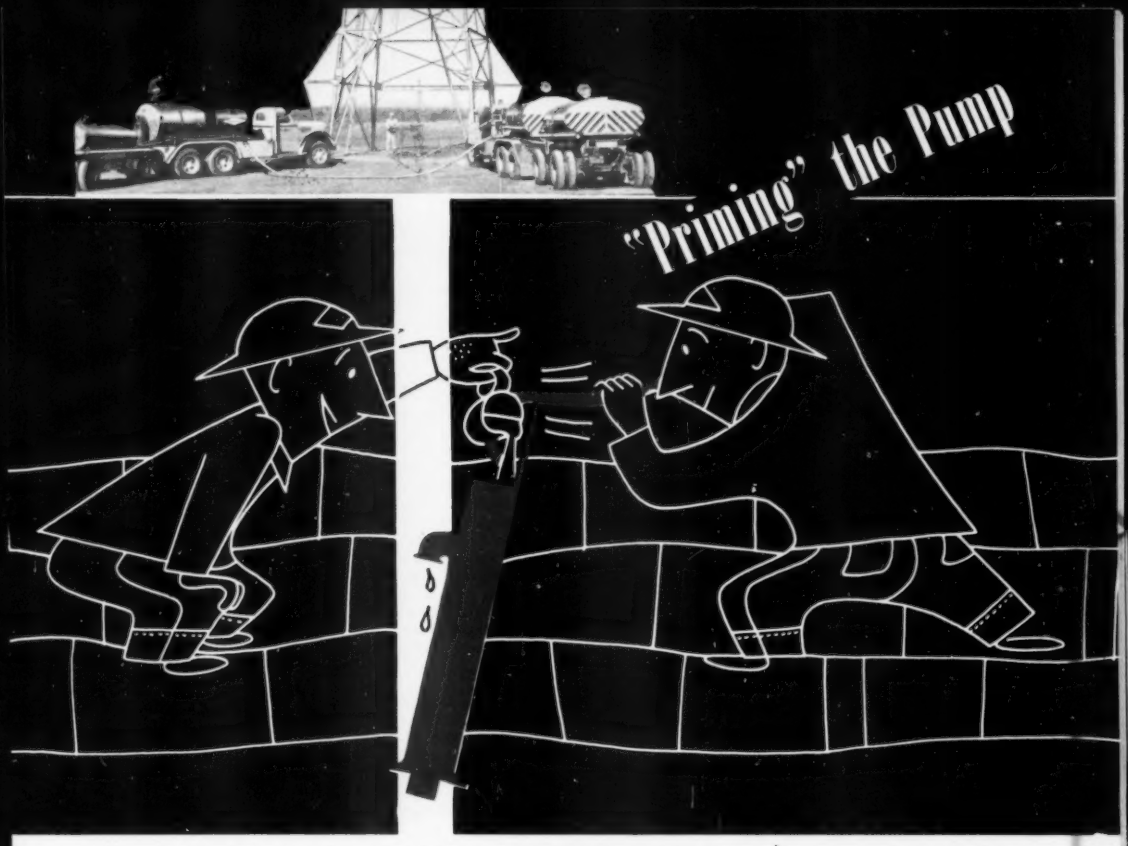
In oil pipe-line construction, Yacimientos Petroliferos Fiscales has under study the construction of a 10-in. which would run from Campo Duran, the new field near the Bolivian border, to San Lorenzo, a distance of about 800 miles. Construction depends on the availability of steel, probably from Italian sources. Plans also call for a separate 10-in. to carry gas from the field.

Much of the pipe-line construction in Argentina has been done by Cia. Technica Internazionale, the Italian firm. The company is now seeking to complete construction of a pipe-rolling mill at Campana outside Buenos Aires. Techint, as the company is known, is laying the Huincul-Conesa line.

International Briefs

A decision on the site for the projected new refinery of Anglo-Iranian Oil Co., Ltd., in Australia is expected when the company board meets in London in January. The plant is being planned for a capacity of about 60,000 bbl. daily.

Arabian American Oil Co., now the world's largest producing company, had a record average of 896,675 bbl. daily in November as compared to 848,100 bbl. daily in October. Runs at Aramco's Ras Tanura refinery in November averaged 175,074 bbl. daily.



PRODUCTION POTENTIAL INCREASED because Dowell XM Acidizing Service reduced silicate swelling

Dowell Acidizing Service offers you the benefit of 19 years of extensive research and the experience gained in over 100,000 acidizing jobs! When you "Look to Dowell" you get the *right* acidizing treatment in your completion or work-over program.

For example, Dowell's experience has shown that some silicates, those of the clay mineral type found in certain dolomite and limestone producing formations, swell during conventional acid treatments. This silicate swelling not only delays the clean-up of the well after acidizing, thus increasing rigtime, but also can actually reduce oil production. Dowell research tackled the problem and solved it. Now, Dowell XM acid . . . which contains special chemical agents to control silicate swelling . . . is available to you for the profitable acidizing of formations known to contain such silicates.

A well completed in a Permian lime formation, known to contain swelling silicates, tested natural at 65 barrels of oil per day. Although acidizing treatments on comparable wells in the area had never given a potential over 100 barrels of oil per day, a 2000 gallon Dowell XM acid treatment produced a potential of 300 BOPD!

Today, Dowell is still pioneering new techniques and new materials to bring you advanced methods for completing and reworking oil and gas wells. When you need an expert acidizing job, call on Dowell to give you the best. There is a Dowell station near you.

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Ask your nearest Dowell station for complete information on these Dowell services and products: Acidizing Service, Electric Pilot Services, Plastic Service, Chemical Scale Removal Service for heat exchange equipment, Jelflake, Paraffin Solvents and Bulk Inhibited Hydrochloric Acid.

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FOR OIL INDUSTRY CHEMICAL SERVICE

PERSONALS

Refinery Manager

Dronberger has been with Pure Oil Co. since 1926

HAL H. DRONBERGER, manager of Pure Oil Co.'s Toledo refinery since last July, has had a 26-year career in the oil industry, most of it in refining operations.

A native of Illinois, Dronberger attended California Institute of Technology and Rose Polytechnic Institute, graduating from the latter. After spending a year in the Signal Hill oil fields as roughneck and tool dresser on a rotary drilling rig, he joined Pure in 1926.

In 1929 he was named process engineer in the firm's refinery-control section. He was transferred to Smiths Bluff refinery at Nederland, Tex., in 1933 as assistant still foreman, and in 1925 he became general operating foreman at the Marcus Hook, Pa., refinery. In October 1937 he returned to Chicago to assist in the design, installation, and operation of instruments on the combination high-pressure units then under construction in Pure Oil refineries.

In 1939 Dronberger was transferred to Smiths Bluff as general operating foreman, and remained there until 1942 when he entered the Navy. After 3 years' service, he returned to Pure and became assistant superintendent of the Toledo refinery. He was named superintendent in 1949, and manager in 1951.

J. Howard Marshall has resigned as vice chairman of the board of Ashland Oil & Refining Co., Ashland, Ky. Marshall went with Ashland as president immediately after the end of the war, during which he served as assistant deputy administrator and chief counsel of the Petroleum Administration for War.

James A. Rehler, formerly district land man for Amerada Petroleum Corp. at San Antonio, Tex., has been elected vice president and assistant manager of Blanco Oil Co. He will also operate as land manager for the A. A. Buchanan interests.

John M. Clevenger, assistant district superintendent for Sinclair Oil & Gas Co. at Crane, Tex., has been transferred to Big Springs, Tex., and promoted to district superintendent.

Lawrence B. Butler, former construction engineer at Tide Water Associated Oil Co.'s Bayonne, N. J., refinery, has been promoted to zone supervisor. Also named zone supervisor was **William J. Dennison,** formerly a process engineer. **John J. Dudowicz** was elevated from zone engineer in the mechanical department to field foreman in the same department.

George L. Logan has become a partner in Lyons, Prentiss & McCord, independent oil partnership. In the future the firm will be called Lyons, McCord & Logan. Prior to becoming a partner in the firm, Logan was employed as an engineer. **John Palmer,** formerly geologist with Stanolind Oil & Gas Co. in Shreveport, has joined the firm.

Thomas C. Frick, division operations supervisor for Atlantic Refining Co. at Midland, Tex., has been transferred to Corpus Christi, Tex., and promoted to Southwest Texas regional coordinating manager.

Dr. William L. Morris has been promoted to senior mathematical physicist in the technical branch of the atomic energy division of Phillips Petroleum Co. This division, located in Idaho Falls, Idaho, is in charge of the operation of the materials testing reactor for Phillips.

John Kelly, administrative assistant to the president of Continental Pipe Line Co. at Ponca City, Okla., has been promoted to assistant superintendent of the Texas-New Mexico division with headquarters at Wichita Falls, Tex.

Dr. O. B. Hopkins, director of the petroleum division of Canada's Department of Defense Production at Ottawa since its organization last February, has returned to his civilian post as vice president of Imperial Oil, Ltd. He is succeeded in the defense post by his deputy, **Dr. Donald M. Morrison,** on loan from Shell Oil Co., with which he has been associated for the past 24 years.

L. C. Neeley, formerly head of the land department for Walter Duncan, Oklahoma City, has resigned to become an independent operator there.

C. H. Hesser, petroleum engineer for Continental Oil Co. at Lance Creek, Wyo., has been transferred to Linch, Wyo., and promoted to field petroleum engineer.

Herman E. Ries, Jr., has been appointed research associate in the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.). Dr. Ries has been associated with Sinclair Refining Co. for the past 15 years.

© Bachrach
E. O. PERKINS

E. O. Perkins has been named general manager of the supply and distribution department of The Texas Co., and **J. V. C. Malcolmson** has been appointed to succeed Perkins as assistant general manager of Texaco's marine department. Perkins joined Texaco in 1920 and was named assistant general manager in 1948. Malcolmson has been with the firm since 1942.

Olin Culberson, chairman of the Texas Railroad Commission, has been appointed to the committee on cooperation between state and federal commissions of the National Association of Railroad and Utility Commissioners.

William C. Lyon, formerly drilling foreman for Shell Oil Co. in Wyoming, has been transferred to the company's coastal division, with headquarters at Ventura, Calif.

George W. Oliver has been named Southwest Texas division superintendent for Humble Pipe Line Co., and **Hickman E. Hensley** has been appointed assistant division superintendent for West Texas. Replacing Hensley in Odessa, Tex., will be **P. Harold Yolland,** formerly assistant district superintendent in Pierce Junction, Tex.

R. C. Turner has been appointed vice president and manager of the western crude-oil purchasing division for B-A Alberta Pipe Line, Ltd., subsidiary of British American Oil Co., Ltd. Turner joined Toronto Pipe Line Co., a B-A subsidiary operating in the United States, in 1946. In 1950 he was appointed general superintendent of pipe-line operations in western Canada.

PERSONALS

Sidney S. Galpin, production geologist and engineer for Peoples Natural Gas Co. and New York State Natural Gas Co., has been transferred from Greensburg to Jeannette, Pa.

Robert J. Meers has joined Loffland Brothers Co. of Tulsa as chief engineer. Meers has been actively engaged in engineering and supervisory capacities with Union Oil Co. of California since graduating from the University of Texas in 1941 with a B.S. degree in petroleum engineering.

G. L. Glespen has been appointed chief of the chemicals and packaging branch of the Petroleum Administration for Defense's materials division. He is on leave for 1 year from American Cyanamid Co., where he was technical supervisor of the petroleum-chemicals department.

Harry Goodin, party chief for Amerada Petroleum Corp., has been transferred from Midland, Tex., to Artesia, N. M.

William E. Posey, formerly with Kemco Drilling Co., has joined Carmen Drilling Co. at Oklahoma City as tool pusher.

Clarence G. Bailey, geologist for Texas Pacific Coal & Oil Co., has been transferred from Sheridan, Wyo., to Fort Worth, Tex.

Eugene M. Henderson, chief engineer of Interstate Oil Pipe Line Co., Shreveport, has been named assistant coordinator of transportation activities for Standard Oil Co. (N. J.), at New York.

William E. Gillen, petroleum engineer for Texas Pacific Coal & Oil Co., has been transferred from Abilene to Breckenridge, Tex.

Michael J. Popovich, formerly a research and evaluation engineer for Sohio Petroleum Co., has joined Texas Eastern Transmission Corp. at Shreveport as gas-reserves engineer. **William E. Bancroft,** formerly with Sinclair Oil & Gas Co., has joined Texas Eastern Production Corp. as a geologist.

R. Gerald Hughes has resigned as president of Denver Basin Oil Co., Brush, Colo., remaining as director of the company. Hughes will devote full time to the newly formed Jackpot Oil Co., Denver. **Joe Gardenhire,** vice president of Denver Basin, will be in charge of drilling, and **Alonzo Petteys,** chairman of the board, will be more active in management of the company.

Alex Clark has been appointed a director and vice president in charge of exploration of Federated Petroleums, Ltd. For the past 5½ years Clark has been division geologist of Shell Oil Co.'s Rocky Mountain division, with headquarters in Casper, Wyo.

John M. Parker has resigned as district geologist for Stanolind Oil & Gas Co., to become geologist for Montex Exploration Co. with headquarters in Billings, Mont.

C. M. Dawkins has been named division traffic manager at Houston for Gulf Oil Corp., succeeding **Joseph P. Gudger** who has retired after 43 years with the company.

John S. Noel, district pipe-line superintendent for Transcontinental Gas Pipe Line Corp., has been transferred from Exton to Malvern, Pa.

Lyman C. Denny, district geologist at Wichita Falls, Tex., for Pure Oil Co., has resigned and will be an independent consulting geologist there. He is president of the Geologists Society of Wichita Falls.

Lee A. Christiansen has been appointed assistant general traffic manager of Sun Oil Co. He has been active in the transportation field for 20 years, and had served as an assistant traffic manager for Sun since July 1950.

Robert Clark, formerly with Skelly Oil Co. at Tulsa, is now in the executive department of Mene Grande Oil Co., subsidiary of Gulf Oil Corp., at San Tome, Venezuela.

Edwin L. Kennedy and **Frank J. Manheim** have become new partners in Lehman Brothers. Kennedy has been with the firm for 10 years, and Manheim for 8 years.

Robert F. Walters will be president of the newly organized Walters Drilling Co., Wichita. Other officers include: **C. Allan Gilmour,** Chicago, vice president and treasurer; **Emory S. Naylor,** Chicago, secretary; and **Lester L. Morris,** Wichita, assistant secretary.

J. W. Morgan has been appointed manager of British American Oil Co., Ltd's, Montreal East refinery, succeeding the late R. F. A. Smith. Morgan joined British American in 1939, and was appointed assistant manager of the firm's Moose Jaw, Sask., plant last year. Morgan has been on loan to the Department of Production for

Aramco Appoints Six New General Managers

BARGER COOPER AUSTIN STAPLETON EEDS

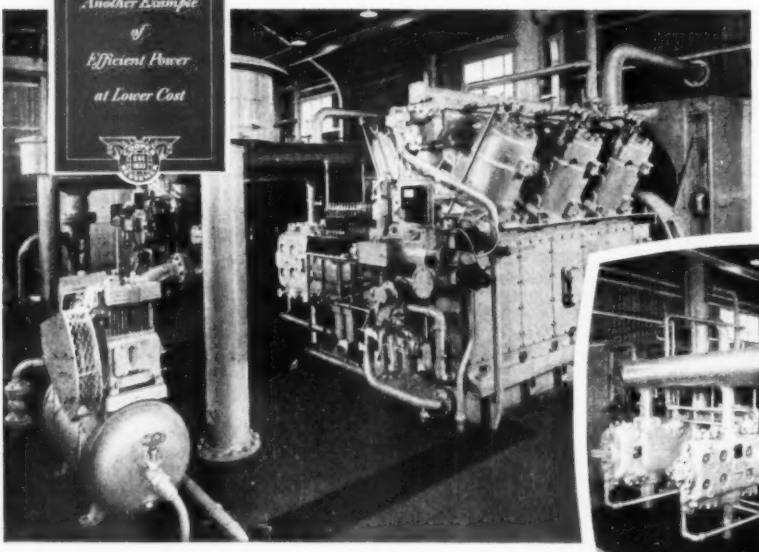
Arabian American Oil Co. has appointed six men to newly created positions in Saudi Arabia.

The men and their new titles are: **T. C. Barger,** general manager for concession affairs; **W. R. Cooper,** general manager of the construction, maintenance, and transportation department; **E. C. Austin,** general manager of materials, supply, and community service; **T. V. Stapleton,** general manager of field management; **R. A. Eeds,** general manager of the field-operations department; and **W. A. Weber,** general manager of industrial relations.

Other appointments announced include **D. N. Ezell,** manager of the manufacturing and supply department, and **S. C. Harper,** assistant to the general manager of oil operations.

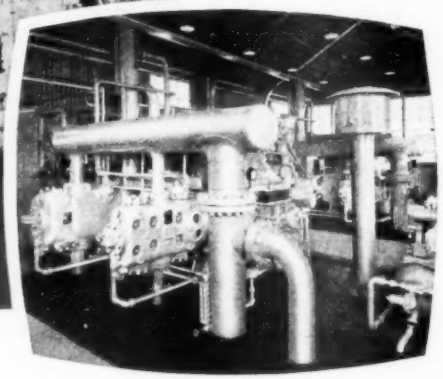
Barger joined Aramco in 1937, and has specialized in government-relations work since 1941. Cooper joined The Texas Co. in 1928 and transferred to Aramco in 1944 as superintendent of engineering. Austin has been with the firm since 1939, serving in various capacities. Stapleton joined Texaco in 1923, and transferred to Aramco as refinery manager in 1944. Eeds has been with various subsidiaries of Standard Oil Co. (N. J.) since 1933 and joined Aramco in 1950 as assistant general manager in charge of oil operations.

Another Example of Efficient Power at Lower Cost



Left: Two Cooper-Bessemer skid-mounted GMX-6 compressors in Lone Star's Abilene Booster Station. Station is piped for either east or west delivery. Units are equipped to provide proper unloading to permit broad flexibility in meeting pressure conditions.

Below: Compressor cylinder side of above skid-mounted units. Floor line is flush with tops of skids resulting in conventional floor appearance and simplicity.



GMX's at Lone Star's Abilene Booster Station

...2 "packages" of flexibility

IT MIGHT surprise you to know that the GMX's pictured opposite are skid-mounted units . . . 2 packages, factory tested and delivered complete with all auxiliary equipment. It's quite an advantage —made possible by the simplicity and extreme compactness of these modern Cooper-Bessemer compressors.

Secondly, and perhaps even more remarkable, is the unusual flexibility of this compressor set-up. The station is piped so that it can pump either east or west —necessitating compressors that would operate efficiently despite widely varying pressure conditions. These GMX's readily provided with the proper unloading facilities to permit such flexibility. And, with suction pressures running lower than anticipated, months on end, it's another example of how well GMX's can handle tough jobs.

If you have a compressor job coming up, tough or simple, get all the money-saving facts on modern, long-lived Cooper-Bessemer V-angles—GMX's, GMV's and GMW's. They're ready to cut your costs on any compressor requirement from 200 to 3,000 hp.

The **Cooper-Bessemer** *Corporation*

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Odessa, Texas Seattle, Wash. Tulsa, Okla. Shreveport, La.
St. Louis, Mo. Los Angeles, Calif. Chicago, Illinois Caracas, Venezuela

PERSONALS

the past 6 months, during which time he was on specific assignments in Washington.

Stanley G. Britton, production engineer for Pure Oil Co., has been transferred from Dollarhide to Midland, Tex.

Forest C. Witmer, seismic-party trainee for Atlantic Refining Co. at Kinsley, Kans., has been transferred to Midland, Tex., as geologist.

Harry Dereniuk, formerly district engineer in Deep Rock Oil Corp.'s Wichita Falls, Tex., office, has been transferred to Tulsa and promoted to chief primary engineer of the firm. Dereniuk is a petroleum engineering graduate of the University of Oklahoma.

L. B. Fugitt, of Stanolind Oil & Gas Co., has been elected president of the Panhandle Geological Society, Amarillo, Tex. Other officers elected were: **Charles E. Buck,** of Skelly Oil Co., vice president; **W. H. McConnell,** of The Texas Co., treasurer; and **Jeanne Allen,** of Gulf Oil Corp., secretary.

James R. Nolan, a petroleum engineer in the Oklahoma City area for Cities Service Oil Co., has been transferred to the Vernal, Utah., field office.

Dudley H. Cardwell, division director of surface geological exploration for Sun Oil Co., has been transferred from San Angelo, Tex., to Dallas. Cardwell has been with Sun for the past 21 years, and has been in San Angelo 4½ years.

E. D. Ackerman, formerly manager of exploration for Creole Petroleum Corp. in eastern Venezuela, has assumed his duties as exploration manager of International Petroleum Co. of Colombia. He succeeds **Paul M. Tucker** who has been shifted to the New York office of Standard Oil Co. (N. J.) on the producing-coordination staff.

E. B. Hymers, who has been associated with Gulf Oil Corp. for more than 38 years, will succeed **C. H. Stevens,** assistant treasurer of the company, who is retiring after more than 45 years with Gulf. **E. N. Yarborough** has been promoted to assistant manager of the treasury department at Houston, succeeding Hymers.

Courtney E. Cook, engineer for Republic Natural Gas Co., has been transferred from Dallas to Ellinwood, Kans.

A. I. Levorsen, consulting geologist at Tulsa, has been elected to the board of directors of the First National Bank & Trust Co. of Tulsa. Levorsen, who recently resigned from the faculty of Leland Stanford University, is a former president of the American Association of Petroleum Geologists.

Fred E. Simmons, Jr., consulting petroleum engineer and geologist of New Orleans, and **E. A. Courtney,** petroleum consultant of Hammond, La., have combined their local offices at New Orleans. Simmons has specialized in geological problems, with emphasis on salt domes, and Courtney has specialized in development and exploration problems for the past 7 years.

Henry Cardwell, formerly South Texas supervisor for Seaboard Oil Corp. and more recently coordinator of land and geology for the company's Mid-Continent division, has resigned to become chief geologist for Spartan Drilling Co. and other G. H. Vaughn interests. He will be headquartered at Dallas.

George V. Dunn, senior petroleum engineer at Seminole, Okla., for Sinclair Oil & Gas Co., has been transferred to Lindsay, Okla. Other transfers and promotions in the production department of the firm include: **William H. Cain,** roustabout at Delaware, Okla., promoted to assistant district foreman; **Winfield S. Hull,** intermediate petroleum engineer at Kiefer, Okla., transferred to Covington, Okla.; **Edward H. Whitlock,** intermediate petroleum engineer at Ardmore, Okla., to Seminole, Okla., as senior petroleum engineer; **Lindal C. Buchanan,** junior petroleum engineer at Ardmore, to Kiefer as intermediate petroleum engineer; **John V. Graham,** intermediate petroleum engineer at Lindsay, to Ardmore; **James W. Curnutt,** intermediate petroleum engineer at Wink, Tex., to Odessa, Tex.; **John P. Hammett,** intermediate petroleum engineer at Hobbs, N. M., to Wink; **Julian M. Simpson,** intermediate petroleum engineer at Odessa, to Hobbs; **C. L. Simons,** junior petroleum engineer at Thrall, Kans., promoted to intermediate petroleum engineer; **Donald W. Bennett,** senior petroleum engineer at Delaware, to Kiefer; **Jack P. Anderson,** junior petroleum engineer at Wichita, promoted to intermediate petroleum engineer; **Douglas F. Flynn,** roustabout at Wink, promoted to assistant district foreman at Pampa, Tex.; **Ralph E. McAvoy,** assistant district superintendent at Oklahoma City, to Sterling, Colo., and **R. M. Kobdish,** division engineer at Tulsa, to Crane, Tex., as district superintendent.

W. D. Cortright, of Tide Water Associated Oil Co., has been elected president of the San Joaquin Valley Geological Society at Bakersfield, Calif. Other officers elected include **Paul E. McGovney,** Honolulu Oil Corp., vice chairman, and **L. B. McMichael,** Standard Oil Co. of California, secretary-treasurer.

Norman G. Kittrell, petroleum engineer for The Texas Co., has been transferred from Liberty, Tex., to Houston.

Lloyd B. Jeffers, formerly chief proration engineer with Sunray Oil Corp., has joined Salmon Oil Corp., Tulsa. Jeffers will be in charge of Salmon's primary-production program.

Thomas C. Buchanan, strong advocate of rigorous natural-gas control, has been named by President Truman as chairman of the Federal Power Commission, filling a post left vacant since **Mon C. Wallgren** resigned last October 1. Buchanan has been a member of the commission since 1948 and served last year as vice chairman.

DEATHS

William Byron Ross, 59, director of research and development for Pure Oil Co. at Crystal Lake, Ill., died in Evanston, Ill., recently. Ross joined the firm in 1935 as assistant to the chief chemist. He was named chief chemist a few years later and in 1943 he was placed in charge of all research and development activities of the firm.

Axel H. Schou, 67, engineer for Tide Water Associated Oil Co. for the past 45 years, died January 8 at Elizabeth, N. J.

Benjamin Greenfield, 70, formerly a research engineer for Cities Service Research & Development Co., died recently at Elizabeth, N. J.

Dr. Carroll H. Wegemann, geological authority on the Rocky Mountains, died recently at Denver.

Chester Claude Moore, 59, district manager for Lone Star Gas Co., died January 9 in Frederick, Okla. He had been with the firm for the past 30 years.

APPLYING TORCH.—Workman at Socony-Vacuum's Olean, N. Y., refinery, applies torch to 100,000-gal. tank of kerosine.

UP IN SMOKE.—Within minutes fire is a blazing fury, which, under ordinary conditions, would be difficult to put out.

STARVED TO DEATH.—Only 5 seconds were required to extinguish the fire with injection of air below liquid level.

Death of a Fire

Socony's new "agitation" method of injecting compressed air below liquid surface puts out tank fire in 5 seconds

A SIMPLE "shot" of compressed air at low pressure, injected below liquid level, has proven to be an effective means of controlling fires in tanks of low-flash-point liquids, Socony-Vacuum Oil Co., Inc., reports.

Although the principle is an old established one, the approach is novel. By injecting the air below the surface of the liquid, agitation results, cooling and reducing hydrocarbon vapors which feed an oil-tank fire. Displacement of surface vaporization and heated oil on the surface is brought about rapidly and effectively.

The air injection is done by using any of the conventional lines with which storage tanks are equipped. The air injected through such lines rises to the surface with entrained liquid, which spreads quickly over the surface.

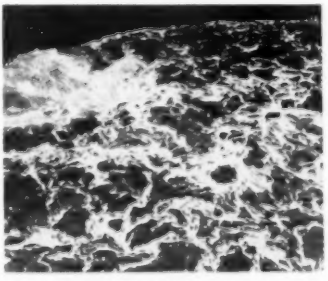
Successful tests.—Developed by Joe L. Risinger, safety supervisor for Socony, successful tests of the method were held in November at the company's Olean, N. Y., refinery. Among those attending the demonstration were representatives of the American Petroleum Institute, National Board of Fire Underwriters, and National Fire Protection Association.

In these tests, a tank containing 100,000 gal. of flaming kerosine was extinguished by the method in 5 seconds, and a tank holding blazing crude oil—always a stubborn fire—was under control in 45 seconds, and put out by firemen applying foam at close range in only 5 minutes.

One of the plan's practical aspects is that no intricate or costly devices are needed, since the air is pumped through lines already built in the tank for other uses, such as the water-drawoff pipe or the product pipe.

The only equipment needed is an available air supply and the proper tank piping hookup.

How it works.—The method is based on a reduction of hydrocarbon vapors which feed an oil-tank fire. In such a fire, the thin layer of liquid at the surface is heated by the combustion of overlying vapors. Heat causes further vaporization to support and extend the combustion. If the heated oil on the surface is displaced rapidly with cooler subsurface liquid at a temperature below the flash point of the product, the vapor supply is reduced, the combustible mixture above the liquid is thinned, and the fire starves out.



ON THE SURFACE.—When air is injected below liquid level, agitation results, which brings cooler product to surface, reducing hydrocarbon vapors which feed the fire. Blaze is literally "starved" to death.

If the liquid is stripped of low flash-point components, the flame front retreats ahead of the cooler liquid, and the fire goes out when the surface is covered. This is the case with kerosine.

Crude "difficult."—However, whole crude containing a gasoline fraction will not be completely extinguished by this method since the flash point is below atmospheric temperature. Turbulence induced by injected air will reduce the fire to a low level, however. Socony engineers say that this condition can be maintained for a long period to prevent boil-over, and to allow use of extinguishing agents without risk of slop-over.

Injection.—During the Olean tests, air was injected from 6 to 10 psig., and injection rates ranged from 40 to 90 cu. ft. per minute.

Injection was tried at several points along the edge of the bottom of the tank, and in other tests air was injected through a perforated pipe extending across the diameter of the tank bottom, a perforated circumferential ring, and a perforated spider. As was expected, the most efficient injection point was found to be the tank center. From that point the rising current of cool kerosine, on reaching the surface, spread rapidly outward to the tank edges. Point injection at the tank edge also caused complete spreading of cooler product across the surface but required more time.

Pipe "Hot Foot"

Electric-welding equipment thaws frozen water lines

GIVING a section of pipe the "hot foot" by electric-welding equipment is an effective means of combating freezing of water lines, General Electric Co. reports.

Welding-generator equipment can be used efficiently to thaw frozen pipes in refineries and natural-gasoline plants because it is self-regulating and can be accurately controlled.

General Electric Co. states that no special accessory equipment is necessary for doing the work other than suitable pipe clamps for making good electrical connections. Strap-type clamps of copper, ample to carry several hundred amperes are recommended.

Here's how the equipment is set up and operated:

1. Clamps connect the conductor cable to the pipe.
2. A file, rasp, or abrasive is used to clean the pipe of rust, paint, grease, or other coatings to assure a good electrical contact.
3. A portable voltmeter is used for checking voltage drop and determining continuity of the circuit.
4. Connections to the welding generator are made in conventional manner with work lead and electrode lead both connected to the pipe on opposite ends of the frozen section. Heat generated in the pipe wall by the passage of current will thaw the frozen section of the pipe.
5. Machine should be set at the lowest current-output adjustment at beginning of thrawing interval to permit checking connections with the least likelihood of flashing.

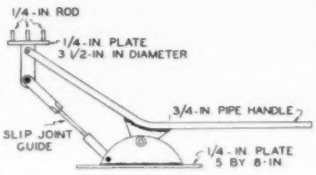
G-E states that while proper current for thawing pipes has been established as between 200 and 500 amp., time needed to complete the job varies greatly according to size, length, kind, and location of pipe; condition of surrounding soil; extent of the freeze; and air temperature.

Larger Steam Line Results In Faster Still Startups

Installation of a larger steam line to the coil inlet in a crude-distillation and cracking still has resulted in faster startups and shutdowns in units at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J.

Suggested by Andrew J. O'Connor, stillman in the refining division of the distillation and cracking department, the change not only brings about faster startups and shutdowns due to an increase in steam supply to the furnace, but is expected to bring about higher gas oil yields.

O'Connor, who was given a $500 "Coin Your Ideas" award, had reasoned that efficiency of the unit could be increased by enlarging the existing 110-psi. steam line to the coil inlet, and then tying it in with the main steam line.



Valve Jack Saves Labor

Bert Mitchell, Skelly Oil Co., Skellytown, Tex., has devised a compressor valve jack for use in installing valves in the bottoms of compressors.

The devise was fabricated for installing valves where clearance from floor or grating is too close to permit lifting by hand. Mitchell claims that the jack works on valves from 8-in. in diameter up.

Mitchell's jack won honorable mention at the recent "Operating Kinks" session of Natural Gasoline Association of America's Panhandle-Plains regional meeting in Amarillo, Tex.

Sealing Device for Spray Headers Speeds Cleaning

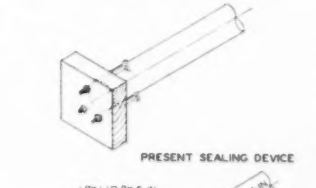
A seal for ends of spray headers, replacing the conventional type using screwed caps or wooden blocks bolted to lugs affixed to the header has been developed by Jim Barton, maintenance superintendent for Phillips Petroleum Co. at Phillips, Tex. *(see drawing)*.

Barton's method facilitates cleaning of spray headers more quickly and economically.

His device consists of a basket box-like receptacle fabricated from ½-in. rod welded to the end of the pipe and of sufficient size to contain a square 2-in. thick wooden block which covers the open end of the spray pipe.

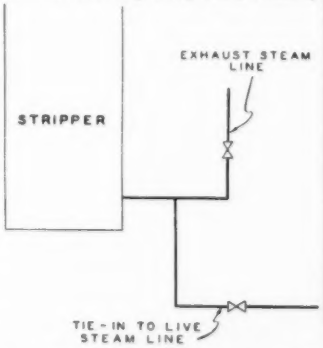
The block fits loosely enough in the container to permit a wooden wedge to be inserted between the block and the ½-in. rod retainer cage at the face of the block. A sharp tap on the wedge forces the block sufficiently tight against the pipe opening to provide a near water-tight seal.

The device received first prize in Class A in the "Operating Kinks" session sponsored by the Natural Gasoline Association of America at its recent Panhandle-Plains regional meeting in Amarillo, Tex.



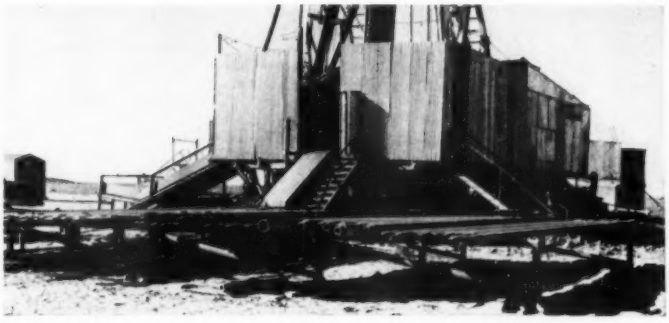
Emergency Steam Lines Used To Hold Pipe-Still Pressure

Humble Oil & Refining Co. has installed emergency live-steam lines on atmospheric tower-stripping steam lines at the Baytown, Tex., refinery to offset pressures encountered in stripping light crudes *(see diagram)*.



Exhaust steam is used in each of the strippers, but when the tower pressure exceeds the exhaust-steam pressure, it is impossible to strip the product with existing equipment. Since tower pressure does exceed exhaust-steam pressure quite often when processing light crudes, the connection was found desirable.

Prevents loss.—In a study of past operations at the pipe still it was found that low initial boiling point absorption naphtha resulted from inadequate stripping. When the initial boiling point on this naphtha stream was less than 260° F., gasoline was lost to the fuel-gas system at the absorption plant. Installation of the live-steam connection will prevent the loss of motor gasoline to fuel gas.



RIG.—McAlester Fuel Co.'s rig on location in Lea County, New Mexico, which is equipped with demountable pipe racks.

Novel Pipe Rack

Made up of several sections, it can be extended without welding, will fit anywhere, McAlester Fuel Co. reports

THE problem of having the right size pipe rack in the right place at the right time has been solved by McAlester Fuel Co.

This firm, headquartered at Magnolia, Ark., is using a demountable rack on one of its rigs in Lea County, New Mexico. The advantages of the rack are:

1. It is made up of several identical sections.
2. Length and width can be extended at will without welding or separating a stack of units.
3. Layout to fit any particular location can be made quickly.

How it's made. — The demountable rack is comprised of four pieces of 4-in. pipe, in the form of a triangular support. The two sides are of convenient length for handling, hauling, and erecting, and base is a vertical post welded to ends of the side pieces.

A slight extension is allowed to attach a foot piece, which supports this end of the section on cribbing, or timber mat, as the case may be. Foot piece is a length of channel iron, and the post is welded to it and reinforced on each side with a gusset plate.

The fourth piece of pipe is inserted between the side members near the center, and serves as a rigid support for the side of the section. The side lays horizontal when made up into the pipe-rack assembly.

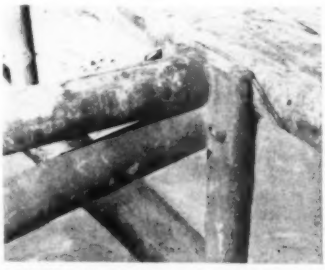
Assembly.—Connectors to permit one section to be attached to others (or the walk) are made of rectangular pieces of flat steel. These are welded to the ends of the horizontal side and the vertical post on one end, and the other, to where both ends of the long pipe are brought together.

Plates on each section are identical in size, weight, and position of application. Matching holes are bored for bolting when assembling.

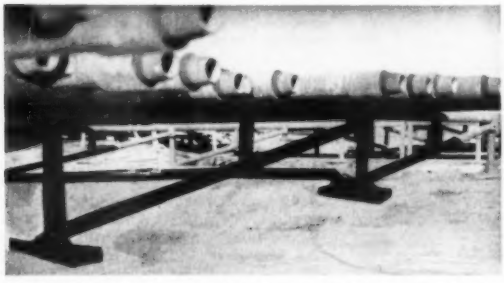
As four sections may be placed on each side of the walk, points for attaching the sections to the walk are provided which are identical in size, design, and position of the bolt holes as the plates on the sections themselves.

All plates, whether on the sections or attached to the side rail of the steel-floored walk, are positioned so that they are flush with the top surface. This enables pipe to be rolled freely.

CONNECTORS.—Two similar plates facing each other as braces connect each section, as above.



SOLID SUPPORT. — Section bolted to side rail of walk, above, provides a continuous support for drill pipe and casing.



HORIZONTAL POSTS.—Section of rack showing horizontal posts set into channel iron. They are bolted with gusset plates.

SUPPORT MEMBER.—View showing section of pipe-rack supporting member. Any one of these members may be used at any point.

Valve Grinder

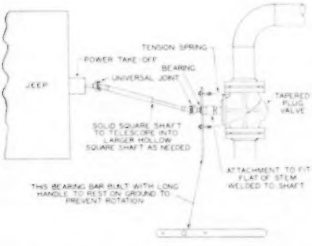
Device grinds leaky valves in field without removal

GRINDING leaky plug valves in the field without removing the valve body from the line is now possible by use of a grinder devised by W. B. Bowen, field foreman for Panoma Corp., Guymon, Okla.

Here's how it works:

From a vehicle's power takeoff shaft, a universal joint is attached. To this universal joint a telescoping or flexible shaft, which can be made of two pieces of square stock, one small enough to slide inside the other, is connected. This shaft is connected to another universal joint. An adapter is then attached which will fit the flat of the valve stems to be ground.

The valve is placed in a prepared slot *(see drawing)* and the vehicle is backed up to front of the valve body, where plug and body are located. Grinding with suitable compound is accomplished by rotating

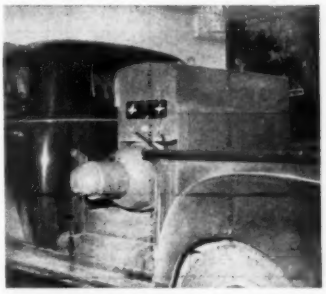


the plug with the power takeoff in reverse and low gears at about 1-minute intervals.

Pressure. — This is properly maintained by use of a steel bar 2 by ¼ by 36 in., which has a small hole cut in one end. About 6 in. from this hole, a larger hole is drilled or cut to fit the shaft just back of the slotted fitting on the valve-plug stem. Six inches from this hole, another small hole is cut. A piece of inner-tube rubber 3-in. wide, or a spring of proper length, to which a wire hook has been attached to each end, is hooked in the steel bar after it is placed on the shaft, passing around the valve body.

The long end of the steel bar may rest on the ground or may be held to prevent its rotating. Flexible shaft is required to grind valves in boxes or when located under ground.

Bowen's adaptation won first prize in Class D, and the grand prize in that division at the "Operating Kinks" session of the Panhandle-Plains regional meeting of Natural Gasoline Association of America at Amarillo, Tex.



MORE ROOM.—By placing the welding generator crosswise instead of lengthwise, this truck bed has more room for tools and other material.

Mounting Welder Crosswise Provides More Truck Space

More room can be made available on truck beds for tools and materials if semipermanently mounted welding generators are installed crosswise just behind the truck cab instead of lengthwise, one Gulf Coast oil company reports. In addition, the arrangement places the welding-machine controls in a handy position for the operator.

Part of a side of the truck bed is cut out near the front of the bed on one side to accommodate the welding machine. Width is well within road limits, and the load is better balanced on the truck.

Electricity Used as Prime Mover Results in Savings

Economics of gas versus electricity for prime-mover power in the water-flooding project in Mid-Burbank Unit, Osage County, Oklahoma, led Kewanee Oil Co., operator, to adopt electricity.

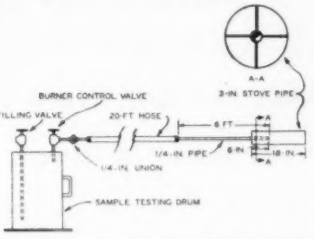
A transmission system using aluminum conductor has been installed to service 40 producing wells, domestic facilities, plant, and office. Aluminum was used primarily because of an acute shortage of copper.

The system utilizes four transformer banks which reduce the transmission voltage of 13,200 to 480 volts for pumping operations. The domestic and plant-lighting demands are serviced from a secondary system through transformers which further reduce voltage to 220/110 volts.

L.P.G. Burner Serves As a Weed and Grass Controller

A simple but effective weed burner developed by J. W. Crockett, repairman for Lone Star Gas Co. at the Hollis, Okla., gasoline plant, is being used to destroy weeds and grass along drain ditches, fence lines, and other areas where open flame is permitted.

A regular testing-sample drum with two ½-in. angle valves on top is used for the fuel container. It is filled through ½-in. copper tubing attached to butane or propane-supply vessel. A 20-ft. length of hose connects the drum to the burner *(see drawing)*.



Crockett's device won third prize in Class C in the "Operating Kinks" session of the Panhandle-Plains regional meeting of Natural Gasoline Association of America in Amarillo, Tex.

Handy Thermometer Holder

A wad of modeling clay is used by one Texas operator for temporary fastening of thermometers to the well heads. Clay is a better insulator than drilling mud customarily used for the purpose, and atmospheric temperatures have little effect on flowing temperature reading of the gas. It is not necessary to wrap the clay with cloth unless flowing temperatures exceed 150° F.

Drilling and Completion Practices . . .

in Meadow Creek and Sussex areas, Johnson County, Wyoming

by Everett J. Reaser

Here are the methods employed by Continental Oil Co. in its development in Powder River basin. The firm finaled 187 oil wells in this area in 3 years.

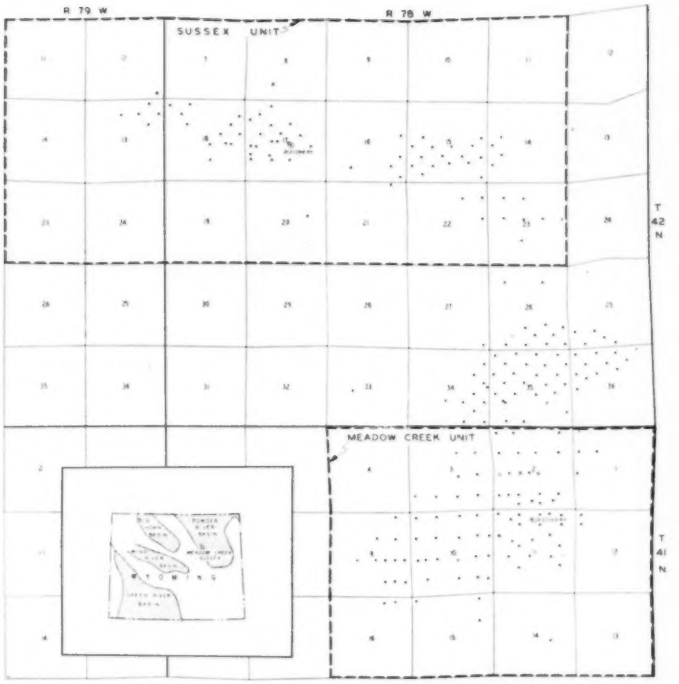


Fig. 1—Oil-production map of Meadow Creek and Sussex units, Johnson County, Wyoming. Insert shows relationship of these fields to Powder River basin.

DEVELOPMENT to the present date has indicated the existence of 20 separate reservoirs in the Sussex and Meadow Creek areas of Johnson County, Wyoming. Eight of these reservoirs are productive in the Meadow Creek Unit but they are not completely defined. Further development may connect some reservoirs now considered separate. For outline of present status, see Fig. 1.

During the past 3 years, 187 oil wells have been completed in this area to September 1, 1951. Of this total, 57 oil wells were completed in the Sussex Unit, 58 wells in the North Meadow Creek area, and 72 wells in the Meadow Creek Unit.

Well spacing.—All development has been conducted on a pattern of one well to 40 acres in each productive sand with the exception that the Sussex sand in the North Meadow Creek area was developed on a spacing of 20 acres per well. In each area where more than one sand is productive, the wells completed in each sand are drilled in different corners of the 40-acre tracts.

In those areas where the Sussex and Shannon sands are both productive, all wells intended for completion in either sand are drilled to the Shannon reservoir and completed in such manner that subsequent recomple-

Sussex Unit "A" production scene, showing central separation and tank batteries for separate handling of Sussex, Shannon, and Lakota oils, left.

tion in the alternate reservoir will be convenient. This arrangement will facilitate ultimately 20-acre development in both of these reservoirs.

Regional Position

Sussex and Meadow Creek fields are located on the southwest flank of the Powder River basin northwest of the city of Casper (see Fig. 1). Reservoir rocks producing in these fields lie in the Gulfian (upper) and Comanchean (lower) series of the Cretaceous system.

Structurally, the Powder River basin is a broad syncline with marginal zones of relatively steep faulting and folding. Interior portions of the basin exhibit very low folding.

Development History

The discovery well of the Sussex-Meadow Creek area was Continental Oil Co. 1 Sussex Unit, NW NW SE 17-42n-78w, which was completed in July 1948 at a depth of 7,726 ft. in the Lakota sand. Initial potential was 605 bbl. per day of 41° A.P.I. sweet oil. The well was drilled on a prospect originally made known by surface geology and confirmed by gravity meter and seismic survey.

Another productive area was proven in May 1949 by Continental 5 Sussex Unit which was also completed in the Lakota sand.

Late that year, Delhi Oil Corp. proved both the Sussex and Shannon sands productive in its well drilled in SE NW NE 35-42n-78w. This well was completed at 3,923 ft. in the Sussex sand with an initial production of 400 bbl. per day.

In the Meadow Creek Unit, two productive areas were proven with completion of Continental's discovery well in NE NE NW 11-4n-78w, with an initial production of 300 bbl. per day in April 1950. Its 5 Meadow Creek was completed from the Lakota sand in September 1950 for an initial production of 384 bbl. per day.

Drilling Conditions: Lakota Sand Wells

Equipment.—Power rigs are being used that have a rated depth of 7,500 ft. These rigs are equipped with 600-hp. draw works powered by two 300-hp. gas engines, one 7¼ by 16-in. and one 7¼ by 14-in. pump powered through the compound by the draw works. Jack-knife-type steel derricks, 126 ft. in height, and 8-ft. substructures are employed. Drill pipe is 4½-in. o.d. 16.6-lb. and drill collars are 6½-in. o.d. by 30 ft. Blowout preventers are manually operated. Steel mud pits are standard practice throughout the field.

Producing wells in the field supply natural gas for fuel. Water wells are drilled for source supply. While weather conditions permit use of sur-

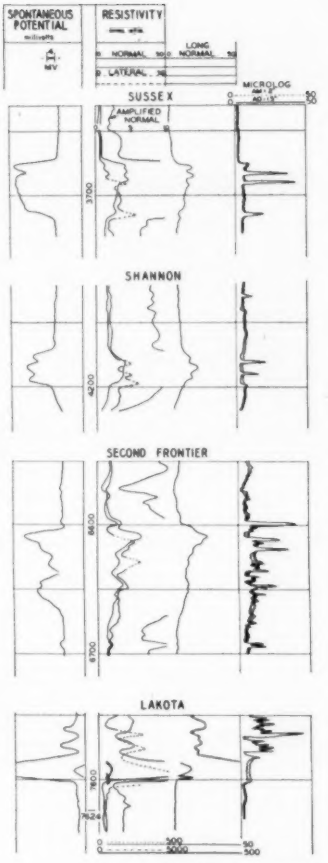
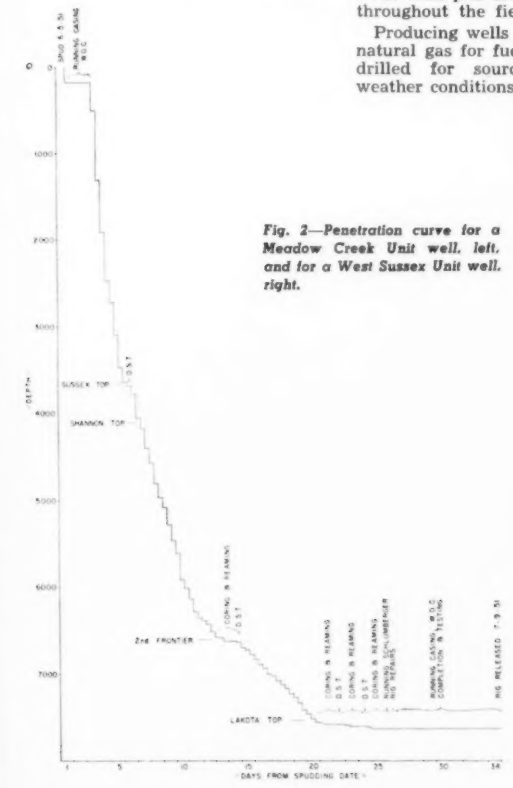


Fig. 3—(Above) Type electric logs of Meadow Creek and Sussex fields, showing pay section detail of Sussex, Shannon, Second Frontier, and Lakota reservoirs. The well is Continental Oil Co. Unit A-57, NE NE SW 2-41n-78w, Johnson County, Wyoming, completed about July 5, 1951. Mud resistivity is 1.4 ohms m./m. at 140° F., at 7,824 ft., total depth. Electrode spacings are AM = 16 in. AM' = 64 in., and AO = 15 ft. 8 in.



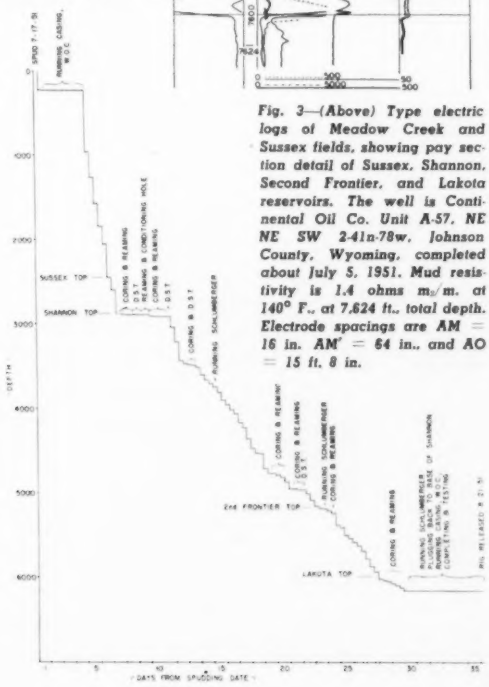
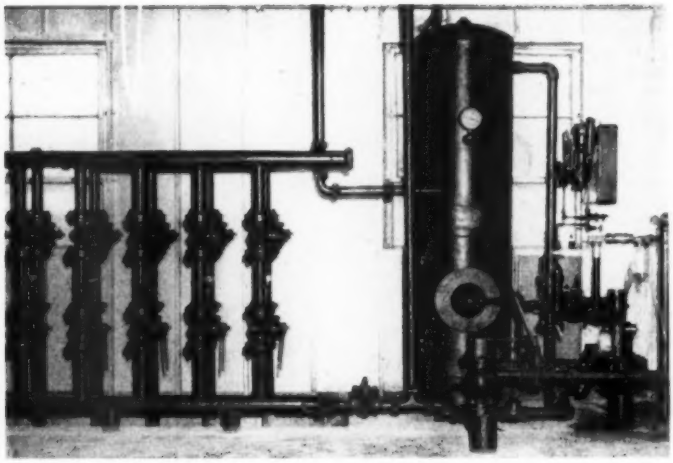


Fig. 2—Penetration curve for a Meadow Creek Unit well, left, and for a West Sussex Unit well, right.



Interior view of battery manifold and test system.

face lines to supply water from these wells during the summer months, during the winter period, water is hauled to the rigs by trucks. Drilling rigs are operated throughout the winter months at temperatures as low as 35° below zero, and it has been found necessary to equip each rig with a boiler.

Lithology and penetrability.—Typical penetration curves appear in Fig. 2. The Lance formation extends from the surface to an average depth of 2,200 ft. This formation, comprising 80 per cent sand and 20 per cent shale, is very soft and drills extremely fast.[1] At a depth of 2,200 ft. the Mesaverde formation is encountered and extends to 3,000 ft. The Mesaverde consists of soft shale and sandy shale. Exceptions are Teapot sand, 25 ft. thick, and the Parkman sand, 450 ft. in thickness, both of which are extremely soft.

The Steele shale extends below the Mesaverde from 3,000 to 5,500 ft. Lithology is medium soft shale with some sandy shale streaks; the Sussex and Shannon sands which produce oil in some parts of the unit are exceptions. The Sussex sand, which lies at 3,600 ft., is 40 ft. thick. The Shannon sand, found at 4,100 ft., is 35 ft. thick.

Niobrara formation, a medium-hard shale, extends from 5,500 to 6,150 ft.

The Frontier, which is reached at 6,150 ft. and extends to 7,000 ft., contains the following sands:

First Wall Creek.—Depth, 6,150 ft.; thickness, 60 ft. It contains several shale breaks. No oil or gas present.

Second Wall Creek.—Depth 6,550 ft.; thickness, 70 ft. This sand produces oil in some parts of the unit.

Mowry shale, comprised of hard shale with a few hard sand streaks, lies at 7,000 ft. The Thermopolis shale at 7,250 ft. has a thickness of 200 ft. and consists of hard siltstone and shale. The Dakota at 7,450 to 7,500 ft. is a very hard siltstone and drills extremely slowly.

The Lakota sand, an important objective, is found at 7,500 ft. and has a thickness of from 40 to 60 ft. Containing some chert and pyrite, the Lakota is hard and abrasive. Bit record for an average Lakota sand well is carried in Table 1.

Drill collars.—In drilling below the surface pipe through the Niobrara at 6,150 ft. range of weight held on bit is from 20,000 to 30,000 lb. From the top of the Niobrara to the Lakota sand, weight on the bit is held from 15,000 to 25,000 lb. From ten to twelve 6¼-in. o.d. by 30-ft. drill collars are used.

Drilling fluid.—When drilling the surface hole, a water-base bentonitic mud is mixed with an average weight of 9.2 lb. per gal. and a viscosity of 36 seconds A.P.I.

After the cement plug is drilled on the surface pipe, clear water is used for drilling fluid to depth to the top of the Frontier formation found at 6,150 ft. Use of water has increased the drilling rate 25 per cent over conventional drilling fluids. No deleterious effects have been observed from the use of water as a circulation medium.

At the top of the Frontier, gel is added to the drilling fluid until the viscosity reaches 40 seconds A.P.I. This will also reduce the water loss to about 12 cc. A.P.I. When a depth of 7,400 ft. (100 ft. above the top of the Lakota sand) is reached, the mud is converted to an oil emulsion. After conversion, mud weight is carried at 9.7 lb. per gal. viscosity at 45 seconds

TABLE 1—BIT RECORD AND DRILLING CONDITIONS OF AN AVERAGE LAKOTA WELL, SUSSEX AND MEADOW CREEK FIELDS, JOHNSON COUNTY, WYOMING

Bit No.		Size (in.)	Depth In	Depth Out	Footage made	Hours run	Weight on bit (lb.)	Rotary speed (r.p.m.)
1		15	0	185	185	3	4,000	110
2		9	185	1,229	1,044	8	20,000	140
3		9	1,229	1,953	724	9¼	22,000	140
4		9	1,953	2,547	594	9	30,000	110
5		9	2,547	3,075	528	8	30,000	110
6		9	3,075	3,618	543	10	25,000	100
7		9	3,618	4,127	509	15	30,000	120
8		9	4,127	4,450	323	13	25,000	110
9		9	4,450	4,472	322	13¼	25,000	120
10		9	4,472	4,940	168	12	30,000	120
11		9	4,940	5,240	300	17½	30,000	110
12		9	5,240	5,462	222	15	30,000	110
13		9	5,462	5,915	453	20½	30,000	115
14		9	5,915	6,253	338	17½	30,000	110
15		9	6,253	6,325	72	5¾	25,000	90
16		9	6,325	6,429	104	17	25,000	90
17		9	6,429	6,531	102	16½	30,000	100
18		9	6,531	6,556	25	5	30,000	100
19		9	6,556	6,660	104	10	30,000	95
20		9	6,660	6,743	83	13½	30,000	100
21		9	6,743	6,839	96	15½	20,000	90
22		9	6,839	6,934	95	15¾	20,000	90
23		9	6,934	7,015	117	14	30,000	
24		9	7,015	7,135	84	14	20,000	
25		9	7,135	7,220	85	7½	15,000	
26		9	7,220	7,349	129	14½	18,000	
27		9	7,349	7,505	156	21½	18,000	
28		9	Reamed core hole reamed 7,505	7,565	60	10	10,000	
29	diamond core	6¼	Drilled plug and 60 ft. of cement; bit No. 18 reamed 10 ft. of core hole from 6,546 to 6,556 ft.					

THE AUTHOR

Everett J. Reaser is regional drilling superintendent, Rocky Mountain region, for Continental Oil Co. at Casper, Wyo. His experience with Continental Oil started in 1932 at Sedwick, Tex., where he was a roustabout and pumper. He advanced to farm boss, district foreman and district superintendent of production in Texas and South Louisiana. In 1946 he left Continental to join J. R. Sharp Drilling Co. at Kermit, Tex., as superintendent, and held this position until 1948 at which time he rejoined Continental in the position he now holds.

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A.P.I. and water loss at 2 cc. A.P.I. Use of oil-emulsion mud in completion operations has increased the productivity of many of the wells.

Coring methods. — Diamond-coring equipment is used in all coring operations in the Meadow Creek Unit. During the early stages of development, conventional equipment was used and results were extremely poor.

However, since introduction of diamond coring, recoveries have been excellent, approaching 100 per cent. Field practice employed 6⅛-in. o.d. diamond core heads with a 50-ft.-length core barrel. On the average, a diamond core head will cut about 700 ft. of Meadow Creek. Salvage has been about 35 per cent.

Drill-stem testing.—On most of the wells projected to the Lakota sand, usually two drill-stem tests are taken opposite the second Frontier sand and three opposite the Lakota sand. Use of drill-stem testing has proven to be an excellent method for determination of productivity of all sands in the unit.

Electric logs.—Conventional electric logs are run in all wells in the unit. On a few of the wells radioactivity logs have been conducted. Typical pay section detail log is shown in Fig. 3.

Casing and Cementing

Surface string.—A 15-in. hole is drilled to an average depth of 180 ft. A string of 10¾-in. spiral well casing is set at this depth. Centralizers, spaced 60 ft. apart, are mounted on the surface pipe. Sufficient cement to reach the surface is circulated.

Long string.—A 9-in. hole is cut to the top of the Lakota. If no water is present, an open-hole completion is made and a string of 7-in. casing run to the top of the Lakota. This is the method used in completing 95 per cent of the wells. However, if water is present in the sand, a 7-in. hole is cut to the base, casing set through the sand, and the well completed by gun-perforating methods.

Cementing. — Since the Shannon, Sussex, and second Wall Creek sands produce oil, it was found necessary that they be protected by cement. Wall scratchers spaced 15 ft. apart are placed on the 7-in. casing from the shoe up through the second Wall Creek sand or from 6,300 to 7,500 ft. Casing centralizers, spaced 90 ft. apart, are used over same interval.

A Baker two-stage cement collar is run in the casing string at 4,300 ft. or approximately 150 ft. below the Shannon sand. Centralizers are used, spaced 90 ft. apart, from 100 ft. below the stage collar up to 3,400 ft. which is about 200 ft. above the Sussex sand. A total of 500 sacks of slow-set cement is used in cementing through the shoe and 300 sacks through the stage collar.

The amount of cement to be used was determined from calculating caliper surveys. Height of the cement

fillup is checked with temperature surveys. However, it was found that the average fillup per sack was only 3 ft. or about one-half the amount calculated from cementing tables.

Procedures.—While cementing through the shoe, the pipe is reciprocated a distance of 15 ft. until the plug is bumped. No difficulty has been experienced with sticking of the casing. After the lower stage is cemented, pressure is released immediately and the two-stage collar opened. Circulation is established through the two-stage collar and it is then cemented. Pressure is maintained for a period of 12 hours and no drilling-out work is done for 24 hours. It is not found necessary to squeeze cement.

Completion Techniques

Drilling in with tubing.—A string of 2½-in. tubing is used for completion. First the two-stage collar is drilled out and the mud displaced with water. The casing is hydraulically tested by application of 2,000-psig. pressure for a period of 30 minutes. Pressure is then released and a drill-stem testing tool run and set above the two-stage collar. In only one instance has a leak been found in the collar.

After the stage collar is tested, water is displaced with mud and the mud conditioned to the top of the lower plug. A pressure of 2,000 psig. is again applied for a period of 30 minutes. The plug is then drilled and the hole conditioned to the total depth. The bit is pulled, the tubing rerun, the mud displaced with oil, and the well swabbed in. Production packers are not used.

Drilling Equipment: Second Wall Creek Sand

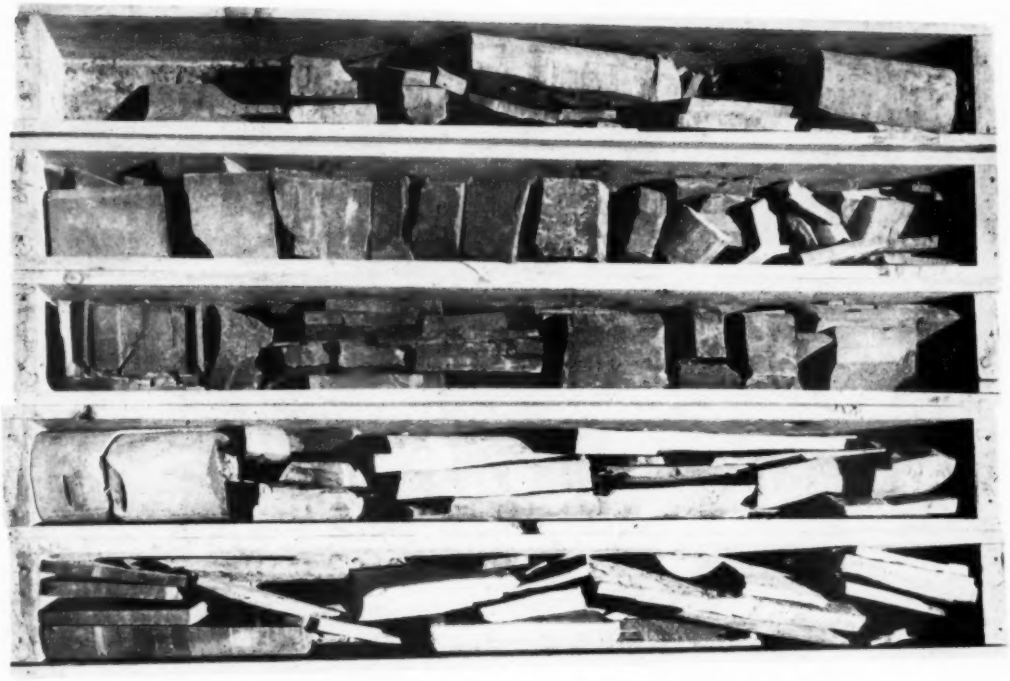
Equipment.—The equipment used in development of the second Wall Creek sand is identical to that employed in drilling the Lakota completions. Penetration rates, bits, weights on bits, mud program, coring, drill-stem testing, well logging, casing, and cementing follow the same pattern as set out in detail above for development of the Lakota reservoirs.

An important exception is the amount of cement put through the shoe and the number of centralizers and scratchers run. On the second Wall Creek sand completions, scratchers are spaced 15 ft. apart from the shoe up 300 ft. Centralizers, spaced 90 ft. apart, are used over the same interval. About 200 sacks of cement are pumped through the shoe. The two-stage collar is located at the same point as in the Lakota wells and the amount of cement used is identical.

Drilling Conditions: Sussex and Shannon Sand Wells

Equipment.—Power rigs with a rated depth of 5,000 ft. are used in development of the Sussex and Shan-

(Continued on page 121)



50 FT.—These samples represent a 50-ft. cored interval of Spraberry pay section.

What are the facts and figures for

"Spraberry Trend" Core Analyses?

by Victor Ogden* and Jack Locke†

THIS report deals with the physical characteristics of the Spraberry formation as determined by core analyses, and the effects of these characteristics on the producibility and storage capacity of the formation. (Paper from "Spraberry Symposium," Midland, Tex., October 19-20, 1951, sponsored by Texas Petroleum Research Committee.)

The productive Spraberry formation in the trend areas of Midland, Glasscock, Reagan, and Upton counties has the following characteristics:

CLEAN SAND

Permeability: .002 to 2.5 md.
Porosity: 6 to 18 per cent.
Connate water: 25 to 45 per cent.
Residual oil: 15 to 25 per cent.

*Core Laboratories, Inc., Midland, Tex., and †Rotary Engineers Laboratories, Midland, Tex.

SHALY SANDS

Permeability: .01 to 0.4 md.
Porosity: 6 to 12 per cent.
Connate water: 25 to 90 per cent.
Residual oil: 0 to 50 per cent.

The controlling influence in the physical properties of the shaly sand is the shale content which may vary, in degree of lamination, from 5 to 50 per cent.

Types of Analyses

Most of the analyses to date have been performed by the conventional retort type of analysis rather than by whole-core analysis. This is because, where the fracture porosity would be of value, the fractures are broken open by the coring process and any reconstruction work would have an indefinite accuracy inasmuch as the core fragments would have to be bound together by tape or wire. Consequently, most of the core analyses have been performed to evaluate the matrix.

The matrix analyses have been complicated by the presence of a material in the shale laminations that is either kerogen or a solid hydrocarbon. This material will not fluoresce under ultraviolet light and will not cut with carbon tetrachloride at normal temperatures; however, at a heat above 700° F. it becomes oil. Vacuum distillation at 450° F. will not remove this substance. Whether this substance is kerogen or a solid hydrocarbon is something that is still not definitely determined. However, we feel that it will not move through the pores of the formation and therefore does not constitute part of the true reservoir of the Spraberry formation.

Fig. 1 is a typical Coregraph in

the Spraberry trend region. Permeability, porosity, and fluid saturations are plotted by the side of a general formation lithology. On the left side of the graph is a **"productive porosity"** plot indicating the productive zones in the interval cored. Productive porosity is the porosity, in rock volume per cent, that was occupied by movable fluid in the formation. Using the residual-oil saturations and connate-water saturations, the productive zones can be interpreted to be either oil or water productive.

In Fig. 1 the productive porosity plot indicates the formation to be productive from the matrix in the intervals 7,152-58 ft., 7,159-64, 7,169-74, 7,176-80, 7,181-82, and 7,186-87 ft. The remainder of the cored interval is nonproductive.

The zone 7,149-69 ft. has two sand stringers, 6 and 5 ft. respectively, that are separated by a 1-ft. interval of sandy shale. Sandy shale above and below these sand intervals seals them from other productive zones, except through the fracture system. The fluid saturations of these sand bodies indicate oil production and the productive-porosity plot shows the residual oil to be the true residual oil of the core samples.

The oil saturation in the nonproductive zones is not movable oil and is not actually residual oil.

The zone 7,169-80 ft. consists of sand grading into a laminated shale and sand with the shale constituting roughly 10 per cent of the formation. The productive intervals in this zone, although having only half of the storage capacity of the upper sand, are nevertheless effective pays. The productive-porosity plot indicates the bulk of the residual oil to be true residual oil and not kerogen or a solid hydrocarbon.

The interval 7,180-88 ft. contains 2 ft. of low-value pay in the sandy shale. The shale content of this interval averages about 75 per cent.

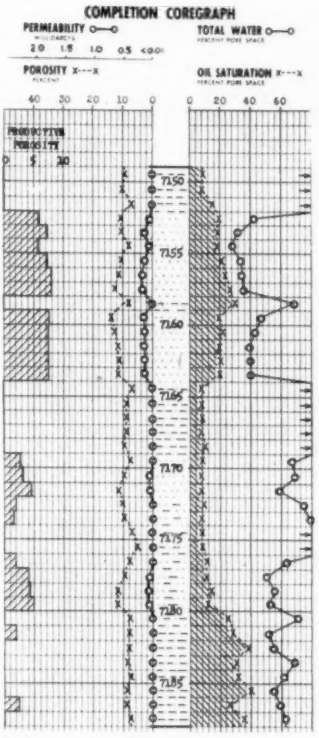


Fig. 1 — Completion coregraph for Spraberry well. Note additional curve for "productive porosity."

Productive porosity indicates the bulk of the residual oil to be kerogen, etc., and therefore not true residual oil prior to retorting.

From the above type of core-analysis figures, movable oil in place per acre can then be calculated. The efficiency of gas-expansion production of the volume of oil is still a stumbling block in any evaluation of the matrix. The indications are that gas-expansion production is more efficient in the Spraberry than in other formations, possibly because of the regularity of the pore size in the "clean" sand and the small size of the pores. These factors could more efficiently utilize the stored energy of the gas bubbles in moving the oil through the matrix to the nearest fracture flow channel.

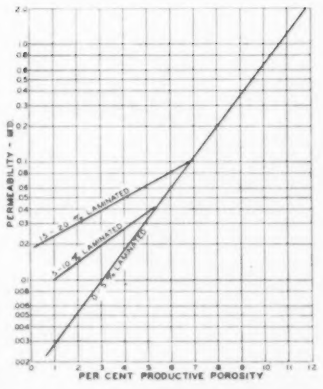


Fig. 2—Semilogarithmic plot of permeability vs. "productive porosity," for various laminated shale-sand percentages.

Permeability vs. Productive Porosity

Fig. 2 is a logarithmic plot of permeability and productive porosity. The relationship is a straight line which touches the zero productive porosity point at approximately .014 md., indicating this to be the lower limit of permeability in the clean sand. Deviations occur below 0-1 md. for the laminated sands and shales and vary with the shale content as shown.

Fig. 3—Spraberry formation sample where 1/32-in.-thick calcite deposit built up along fracture plane during geologic time.

Fig. 4—Example of multiple vertical fracturing of Spraberry.

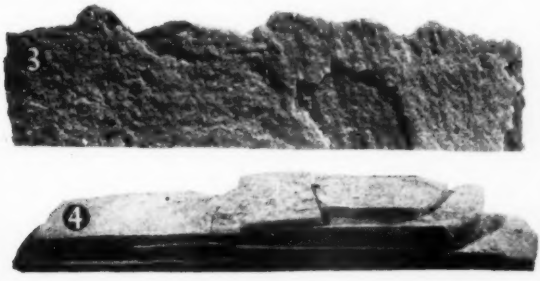


Fig. 5—Example of cement (1/32 in. thick) which set up in fracture in Spraberry.

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Fracture System Channels

All production in the "trend" area is as dependent upon the fracture-system channels as it is upon the matrix for storage. Several examples of the fracture system are presented here.

Fig. 3 shows a fracture with a calcite deposit 1/32 in. in thickness along the fracture plane.

Fig. 4 is an example of multiple fracturing. The horizontal breaks were probably caused by the coring process or during the removal of the core from the core barrel.

Fig. 5 is an example of cement occurring in the fractures. This cement was found 14 ft. below the casing point and is approximately 1/32 in. in thickness. Cement has been found as far as 90 ft. below the casing point.

Fractures vs. Production

Several interesting problems have been worked out concerning the effects of the fractures upon the production rates. The flow rates of the Spraberry **if unfractured** have been calculated using normal radial flow equations, 40 ft. of permeable sand, and optimistic data for pressure drawdown and fluid properties. The result of this calculation indicates that under ultimate conditions the sand body in question could not produce greater than 5 to 10 bbl. per day.

If, however, a fracture is present, extending through the well bore a distance of 100 ft. in each direction and is sufficiently open to minimize the pressure drop from the fracture extremity to the well bore, the productive sand area is increased 128 times for a 12-in. well bore and 192 times for an 8-in. well bore.

The above illustrations are extreme examples in that the conditions used in the calculations could not be duplicated in actual practice; however, they serve to illustrate the part the fractures do play in the drainage of the Spraberry reservoir.

BOOKS

A.S.T.M. STANDARDS ON PETROLEUM PRODUCTS AND LUBRICANTS, Prepared by A.S.T.M. Committee D-2, on Petroleum Products and Lubricants. Published by American Institute of Mining and Metallurgical Engineers, 1916 Race Street, Philadelphia. 784 pp. $5.75.

This 1951 compilation of A.S.T.M. standards brings together in compact, readily usable form, most of the A.S.T.M. standards, test methods, and specifications widely used in this field. It gives in their latest form 129 A.S.T.M. standards, including 116 test methods; 7 specifications; 1 classification; 3 lists of definitions relating to petroleum, specific gravity, and rheological properties of matter; 2 tentative recommended practices for the purchase of uninhibited mineral oil for use in transformers and in oil circuit breakers, and for designating significant places in specified limiting values, and other material.

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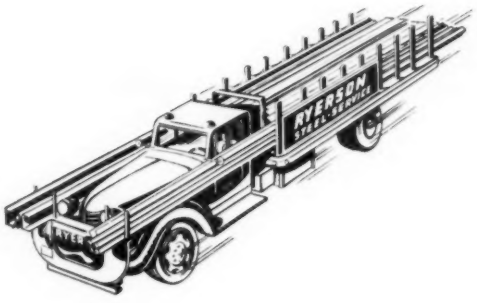

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Checking Heat-Exchanger Performance

by C. H. Gilmour*

The method described here takes much of the drudgery out of heat-exchanger calculations and it is accurate.

PRACTICALLY every processing engineer has at some time or another calculated an over-all heat-transfer coefficient from observed data. Probably only a small percentage has accomplished what might be termed the reverse procedure, namely, designed a heat exchanger in accordance with certain desired performance specifications. Those who have either done this or attempted to do this have discovered that there is a distinct difference in the procedure.

*Staff engineer, Carbide & Carbon Chemicals Co., South Charleston, W. Va. Presented at sixth annual technical session, South Texas Section, American Institute of Chemical Engineers, Galveston

When calculating an over-all coefficient from observed data all factors are known except the coefficient itself. This is determined from the familiar expression $U = (q/A)\ \Delta T$. When, on the other hand, one proceeds to design a heat exchanger the only factor in the above familiar expression that is known with certainty is q, the heat load.

The mean-temperature difference is known only in case the fluids are in fully countercurrent or fully concurrent flow. But if the tube and shell passes are equal in number then the true mean-temperature difference is not known until the number of shell and tube passes are stipulated. The coefficient is unknown because it depends upon the number, diameter, and length of tubes, the nature of the baffling on the shell side, and of course the physical properties of the fluids.

Various Design Approaches

There are various ways of consummating a design. One is to assume a coefficient, calculate an area, reduce this area to terms of number, diameter, and length of tubes and then check the area so calculated against theoretical expressions for individual film coefficients to see if the assumed coefficient is valid. If a satisfactory check is not obtained then a second guess is made and the procedure repeated. Another way is to find a heat exchanger which is doing a similar job and size the new exchanger by a proportioning procedure.

A third method is to assume a tube side velocity of say from 2 to 5 ft. per second, calculate the film coefficient for the tube side and further assume that it is controlling. Then a maximum length of shell is selected which fixes the number of passes and also the diameter of the shell. The baffle spacing is so chosen that the film coefficient on the shell side is so large that it does not significantly alter the over-all coefficient and a fairly reasonable design is accomplished.

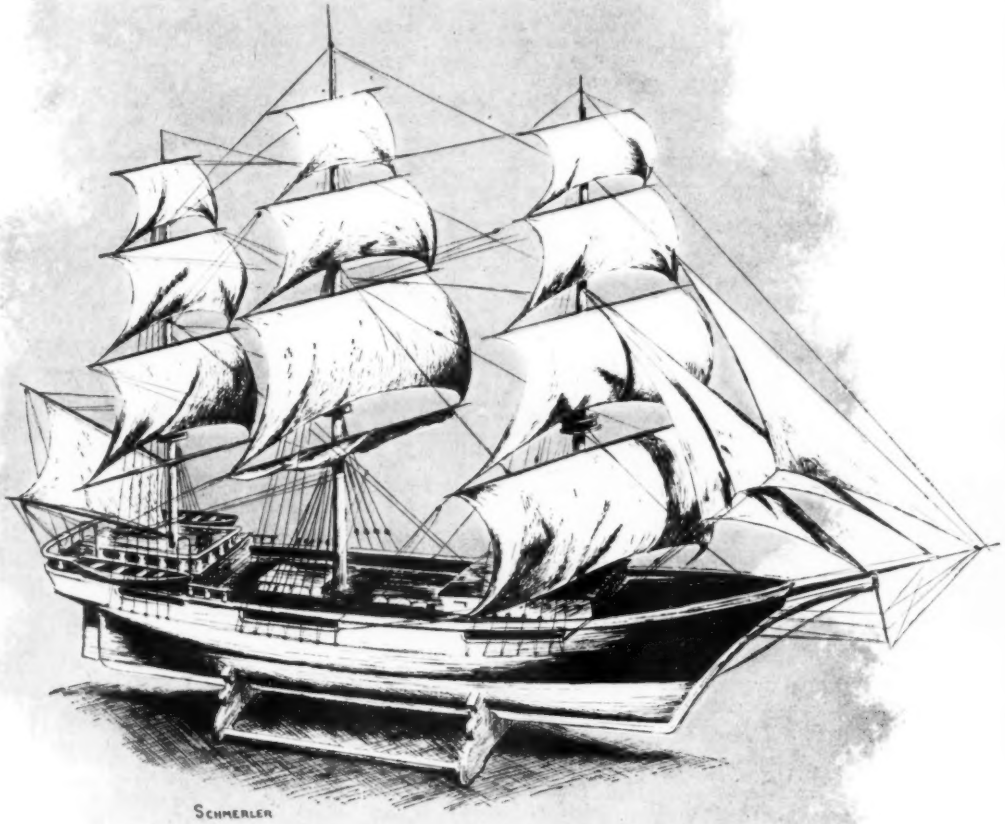
All of these methods are time consuming and somewhat inaccurate and unless the designer is endowed with considerable patience he will not conclude the calculation. It is the purpose of this paper to indicate a design procedure which although somewhat involved in its development results in a method which is both ex-

COMPUTATIONS FOR HEAT EXCHANGERS — ITEM NO

A	B TUBE SIDE	C SHELL SIDE	D TUBE WALL	E FOULING
MATERIAL	ORGANIC MIXTURE	ORGANIC MIXTURE	COPPER	SCALE TAR POLYMER
NUMERICAL FACTOR F_n	TUBE SPACING: TRI; ORGANIC 2.62	TRI; 0.270	159	3820
PHYSICAL PROPERTY FACTOR F_p	μ 0.62; M 59.6; ρ 0.95; F_p 2.0	μ 0.49; M 60; ρ 0.97; F_p 2.1	C_p 0.53; K 226; C_p/k 0.00235	C_p; h; C_p/h
WORK FACTOR F_w	W_t 100; dt 70; ΔT_m 24; F_w 29	W_s 80; ΔT 90; ΔT_m 24; F_w 320	W_t 100; dt 70; ΔT_m 24; $Wdt/\Delta T_m$ 291	W_t; dt; ΔT_m; $Wdt/\Delta T_m$
MECHANICAL DESIGN FACTOR F_{mc}	n 86; d_t 0.62; L 72; F_{mc} 0.0038	n 86; N_{pp} 6; L 72; P 7.625; F_{mc} 0.0021	d_o 0.75; d_i 0.62; d_o-d_i 0.13; $\frac{d_o-d_i}{n d_i L}$ 0.13/4650	n 86; d_o 0.75; L 72; nd_o 64.5; $1/n\,d_o L$ 1/4650
PRODUCT $F_w \cdot F_p \cdot F_{mc}$	0.578	0.382	0.00168	
ΔT_m 40; ΔT_L 20; DIFF 20; RATIO 2; ΔT_{LM} 29; F 0.83; ΔT_m 24	t_o 100; t_i 30; t_o-t_i 70; T_i-t_i 110; t_o+t_i; t_{avg}	HIGH; LOW; dt 70; ΔT 90; R 0.636; 1 - 2 imp.; 2 - 4 0.50; 3 - 6 0.83; 4 - 8	140 T_i; 50 t_i; T_i-t_i 90; t_o-t_i 70; T_i+t_i; T_{avg}	PRODUCT TUBE 0.578; PRODUCT SHELL 0.382; PRODUCT WALL 0.00168; PRODUCT FOULING
PRESSURE DROP	OR t_o-T_i WHICHEVER IS POSITIVE	PASSES; F FACTOR		SUM OF PRODUCTS 0.96168
f_{mc}	0.95	$\frac{0326}{\rho}$ 0.344		THIS SUM MUST BE EQUAL TO OR LESS THAN 1.
f_w	1.30	W_s^2 6400		
$L_o/4$; U-BEND +18; STRAIGHT +25; MULTIPLY BY N_{pp}; $*M_d$; f_{wd}	19.35; 44.35; (6); 266; 2.7	$\frac{L}{P^2 D_o}$ $\frac{36}{440 \times 15.25}$		ITEM NO; SURFACE AREA SQ FT; SPECIFICATIONS SK-; SIZE; n - d_o - L_o - D_o
PRODUCT $\cdot \Delta P$ $f_{mc} \cdot f_w \cdot f_{wd}$	3.3 PSI	11.8 PSI		

Fig. 1—Computation sheet on which are placed data obtained from nomographs. Figs. 2 through 9.

FROM STEM TO STERN



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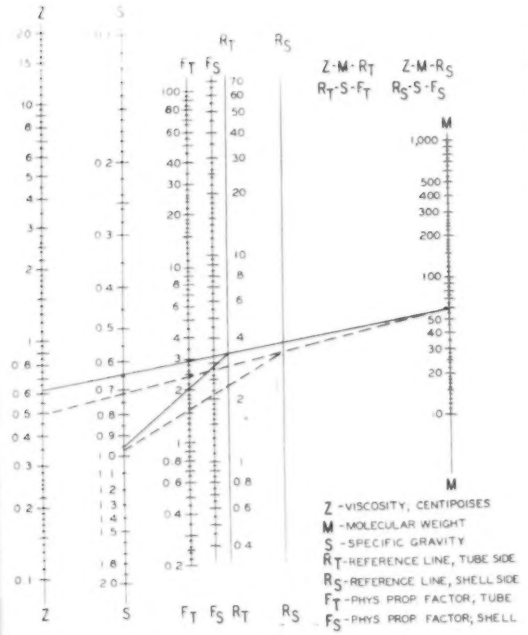


Fig. 2—Physical properties factor for liquids in turbulent flow.

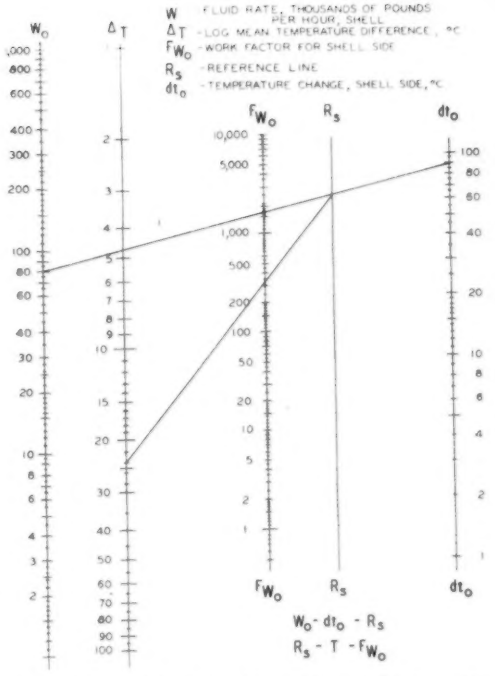


Fig. 3—Nomograph for determining work factor (F_w) for tube side.

tremely accurate and extremely simple.

Since the area, coefficient, and temperature difference are each dependent on tube number, diameter, and length and since the latter terms represent the desired quantities in the design, the separate calculation of the former terms represents useless work. In order to eliminate these useless steps it is necessary to combine all the significant expressions into a single equation which will contain factors relating to the physical properties of the fluids, the tube wall, and the fouling material; factors indicating the work to be accomplished, i.e., the number of pounds per hour to be heated or cooled through a certain temperature range with a certain temperature difference; and finally factors relating to the mechanical design of the heat exchanger, namely, the number, diameter, and length of the tubes.

Since the over-all coefficient is dependent upon the individual film coefficients it becomes necessary to write a separate expression for each of the four resistances involved, namely, (1) the tube side film, (2) the shell side film, (3) the tube-wall resistance, and (4) the fouling resistance.

For the most common type of heat exchanger which consists of one in which one fluid is heated by another without change in phase, this rationalization is accomplished as follows:

1. A heat balance is written for each resistance:

$$w\,c\,dt = h\,A\,\Delta T$$

2. The expression for the coefficient obtained from the Colburn correlation is inserted for h for the fluids:

$$(h/cG)\,(cz/k)^{2/3} = f/2$$

3. The area is inserted in terms of number, diameter, and length of tubes:

$$A = n\,\pi\,d\,L$$

4. The equation is then solved for ΔT the temperature drop across the film.

5. The sum of these temperature drops equals the total temperature difference and if each term is divided by the temperature difference then the sum is equal to unity.

6. If all the numerical quantities are combined into a single quantity we then find that we have as a result of this rationalization four significant factors for each resistance. Since many of the terms in these factors are power functions, solution is accomplished easily by alignment charts.

7. The sum of the product of the individual film factors must equal unity or be less than unity for a valid solution.

The factors which are obtained for the case where the Reynolds number of the tube side fluid is in the fully turbulent range (Re = 10,000) and in which the shell side fluid is a cross-flow (baffled shell) are shown below:

$$F\ (\text{tube}) = 2.62\ (z^{1\,4/3}\,M^{3/8}/s^{9/8}) \times (W_t^{0.8}\,dt/\Delta T)\ (d^{0.8}/n^{0.8}\,L)$$

$$F\ (\text{shell}) = 0.27\ (z^{0.8/3}\,M^{3/8}/s^{9/8}) \times (W_s^{0.6}\,dt/\Delta T)\ (N_{PT}{}^{0.36}\,P^{0.6}/n^{0.718}\,L)$$

$$F\ (\text{wall}) = 159\ (c_p/k_p) \times (W_t\,dt/\Delta T)\ (d_o - d_i/n\,d_o\,L)$$

$$F\ (\text{fouling}) = 3{,}820\ (c_p/h_F) \times (W_t\,dt/\Delta T)\ (1/n\,d_o\,L)$$

By similar rationalization process using the Colburn j factor concept the pressure drop may also be obtained as a product of three significant functions:

$$\Delta P\ (\text{tube}) = (z^{0.2}/s) \times (W/n)^{1.8} \left[\frac{N_{PT}\,(L/d_i + 16 \text{ or } 25)}{(5.4\,d_i)^{1.8}}\right]$$

$$\Delta P\ (\text{shell}) = (0.326/s)\ W^2\ (L_s/P')\ D_s$$

These factors may be transposed to a computation sheet on which the results obtained from alignment charts may be recorded. A specimen copy of a computation sheet is shown in Fig. 1. It should be pointed out that the use of this computation sheet does not eliminate a trial solution for

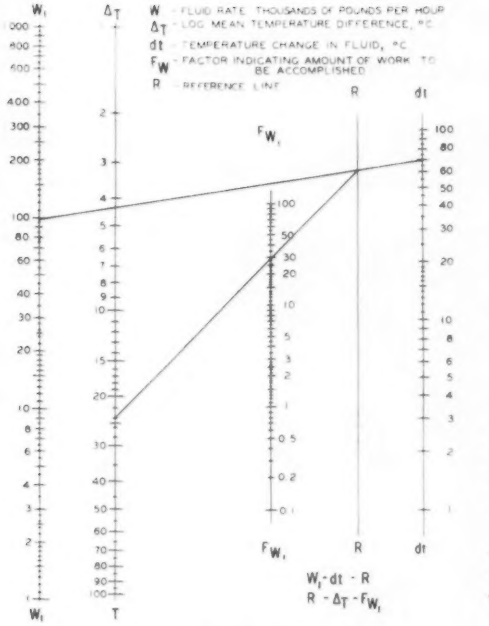


Fig. 4—Work factor (F_W) for shell side.

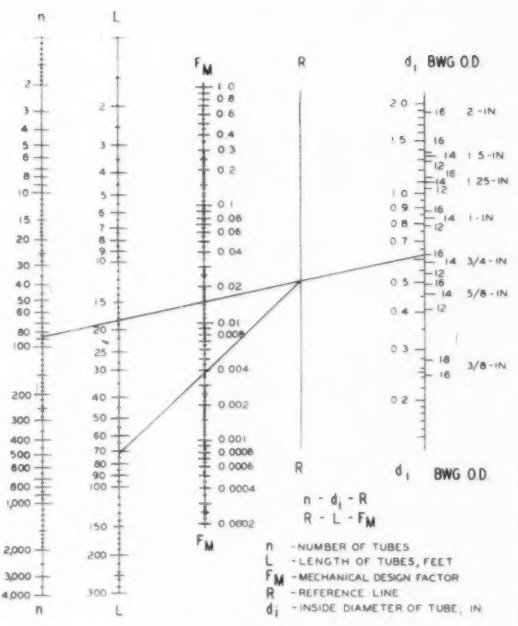


Fig. 5—Mechanical design factor (F_M) for tube side.

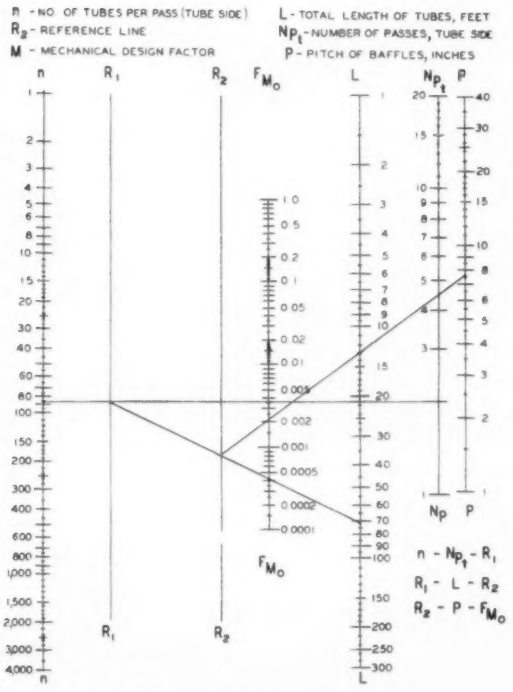


Fig. 6—Mechanical design factor (F_M) for shell side.

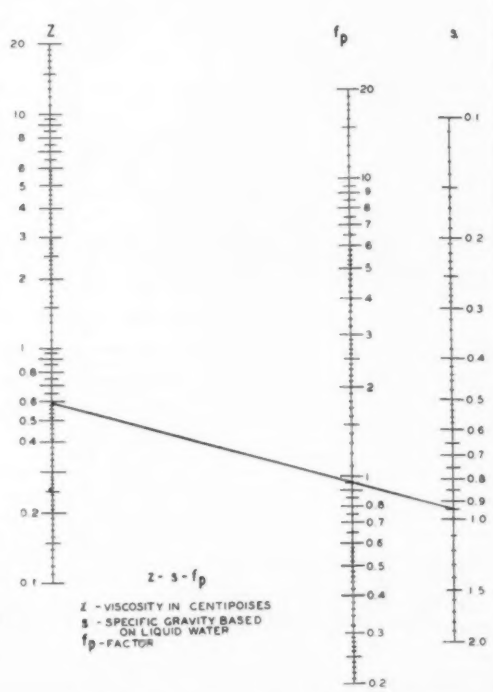


Fig. 7—Physical property factor (f_p) for pressure drop.

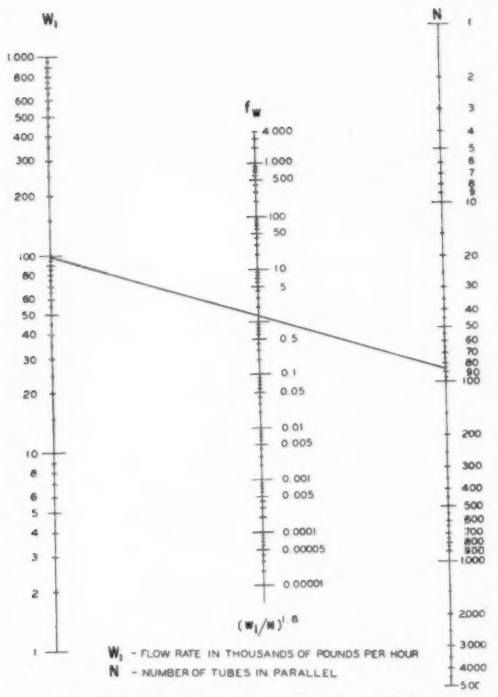


Fig. 8—Work factor (f_w) for pressure drop calculation.

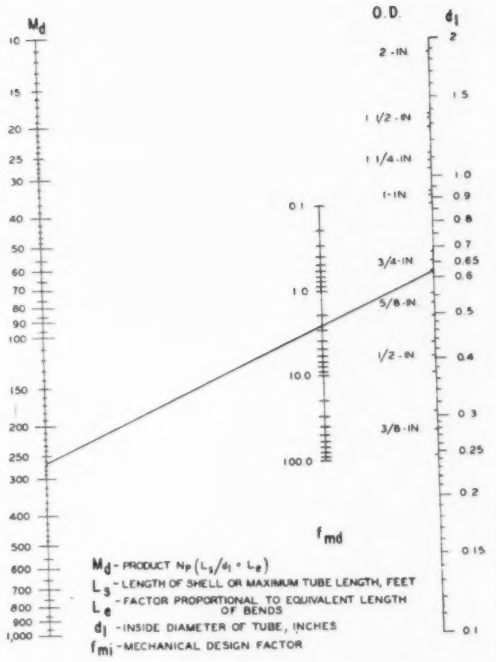


Fig. 9—Mechanical design factor for pressure drop calculation.

the number and length of tubes but if the designer has a table of standard tube counts at hand, the number of trial calculations is reduced to a minimum.

Briefly, the use of this computation sheet is as follows:

The known physical properties are placed in their respective lines and columns.

The known mass flow rates, temperature ranges, and temperature differences are also recorded.

The various factors are then obtained from the alignment chart and placed in the proper location.

By inspection, one can determine approximately the value of the mechanical design factor which will result in a satisfactory solution. Then the trying various combinations of tube number and tube length the mechanical design factors are calculated and the production of the four factors for each of the resistances may then be obtained. These four factors are then added together in Column E and the same procedure is followed until the sum of the four factors is equal to or less than unity. After this condition is satisfied, calculations are made in the pressure-drop columns for the tube side and the shell side to see if pressure-drop restrictions are satisfied.

Although the use of this method for designing a heat exchanger produces the final answer within a few minutes it does not take care of other factors that must be considered in satisfactory heat-exchanger design. For example, in order for the heat exchanger to work in accordance with specifications the clearance between the baffle and the shell should be maintained at an absolute minimum, the baffle cut should be between 20 and 25 per cent of the shell diameter and the placement of shell side nozzles should be such that the full length of the tube is effective for heat transfer. In other words, for the successful use of this computation sheet a certain amount of background in the fundamentals of heat-exchanger design is required.

The main advantage of this system is the elimination of useless information, the reduction in time required for design and the recording of all necessary information relative to the design on a single sheet of standard size.

This computation sheet has additional utility in that the data obtained from existing exchangers may be recorded and an unknown quantity such as fluid viscosity or fouling factor may be obtained by operating the system in reverse.

Heat exchangers will behave in accordance with desired performance specifications if they are designed with the proper mechanism and theory as a basis and if they are fabricated in the manner that the design calls for. Special care must be taken to see that the flow through the tubes is fairly uniform and that there is a minimum of leakage on the shell side. A uniform procedure for design should be used in order to obtain consistent results. By combining all expressions which apply to heat-transfer specifications into one expression design equation boils down into a simple formula containing four significant factors.

The computation sheet shown was constructed by this method. Although it eliminates reference to heat-transfer coefficients, nevertheless the effect of all variables in heat-exchanger design are indicated. Although used primarily for design purposes this computation sheet also works in reverse, that is, it may be used to find unknown quantities from observed data on heat exchangers which are actually performing. By using this method of design with a reasonable amount of judgment, the task of heat-exchanger design becomes a simple routine procedure and the accuracy is all that can be desired.

Illustrative Problem

The data obtained from the nomographs, Figs. 2 through 9, are tabulated in Fig. 1. To illustrate the various steps made in using this method the following problem is presented:

(Continued on page 119)

REPORT ON

Operating the Rich-Oil Rectifier

by Edward G. Ragatz*

Rich-oil rectifiers are desirable for high propane recoveries. This paper gives "know how" for various rectifier flow schemes, and details the important efficiency and control factors associated with their operation.

MOST of today's natural-gasoline plants contemplating a reasonably extended operating life can anticipate, in the near future, serious questioning regarding their ability to produce efficiently high-percentage yields of propane. A properly processed rich-oil rectifying unit is an essential element in such production. Its position with respect to high-percentage absorption recovery of propane may be summarized as follows:

1. The prime function of the rich-oil rectifier is to efficiently remove all undesired light components from the rich oil ahead of the stripping still with a minimum accompanying loss of desired heavier fractions.

2. Installation of a rich-oil rectifier should be given serious consideration whenever stock-tank recoveries of "net" propane are desired in excess of 50 per cent.

3. The excessive heat consumption of the earlier simple cycles can be substantially reduced by employment of appropriate "side stream" heat interchange at the rectifying section of the unit.

4. In high-percentage propane-recovery operations, it will usually be necessary to employ an auxiliary "trimming" control for correlating the unit's operation with 24-hour cycle changes in plant-intake quality.

5. Of the various auxiliary controls available, direct measurement and control of the volume of vapors introduced into the base of the rectifier offers the most promise—particularly when correlation with an adjusted reboil temperature control is required.

6. If the 24-hour cycle change in feed quality is large, it will usually be necessary to coordinate adjustment of the reboil temperature with the auxiliary control to obtain the desired objective of high rectifier-retention with precise control of light end-product quality.

*Consulting engineer and associate, J. B. Gill Co., Long Beach, Calif. This report from paper presented at twenty-sixth annual C.N.G.A. meeting Los Angeles.

Rich-Oil "Stripping Cycles"

IN early absorption-plant operations propane recovery was a "side issue." Oil-circulation rates were quite low. Resultant volumes of light vapors released from the "flash tanks" and stripping still "accumulators" were correspondingly low. Such vapors were readily handled at appropriate reabsorbers at little additional investment and operating cost.

As oil-circulation rates were increased looking to increased propane recoveries the accompanying volumes of plant vapors requiring reabsorption treatment steadily increased until process changes in the original simple low-pressure plant cycles became necessary.

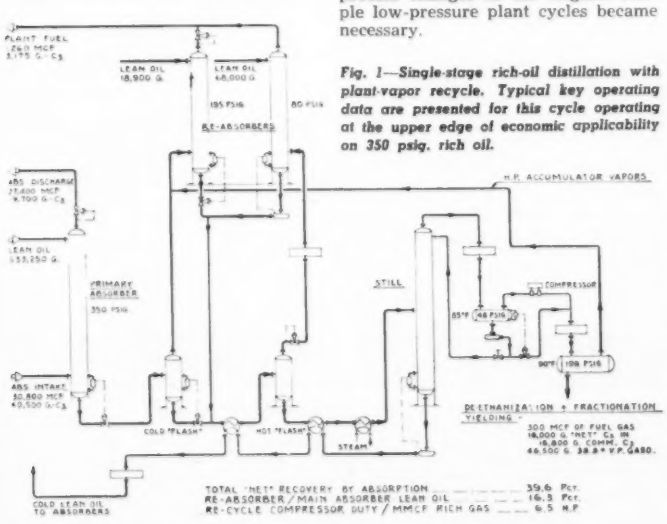


Fig. 1—Single-stage rich-oil distillation with plant-vapor recycle. Typical key operating data are presented for this cycle operating at the upper edge of economic applicability on 350 psig. rich oil.

Single-stage stripping. — The most obvious initial change (Fig. 1) involved compressing the low-pressure still accumulator vapors to a substantially higher pressure for introduction into a second, high-pressure, condensing and accumulating stage—with the low-pressure still condensate being simultaneously pumped into the higher-pressured condenser for its "sponge" effect. This change improved efficiency of increased propane-recovery operations by decreasing volume of accumulator vapors released and increasing pressure at which the reabsorber could be operated. This improvement, however, proved to be economically effective over only a small additional propane recovery range.

Typical data (Fig. 1) show that despite absorber recovery of propane amounting to only 51.4 per cent (with corresponding net stock-tank recovery of only 39.6 per cent), reabsorption-oil rate and recompressor horsepower requirements were such as to preclude economic increase in these relatively low propane recoveries. This is due to: (1) large volume of vapors handled by recompressors at relatively high compression ratios, and (2) low pressures employed at reabsorbers.

Two-stage stripping.—In this cycle (Fig. 2) the first stage of vapor compression is effected by application of heat rather than mechanical energy. Differences in feed quality and absorber pressures, as well as the fact that compressor condensate was being handled in the operation of Fig. 2 while omitted from that of

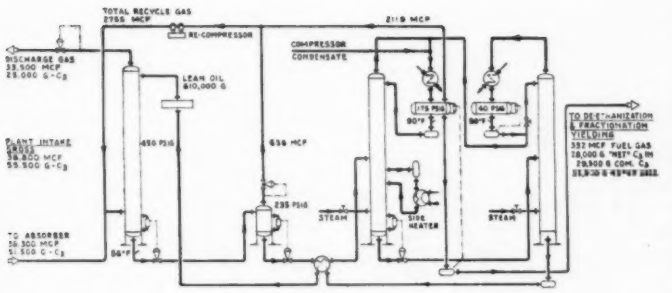


Fig. 2—Two-stage rich-oil distillation with plant-vapor cycle.

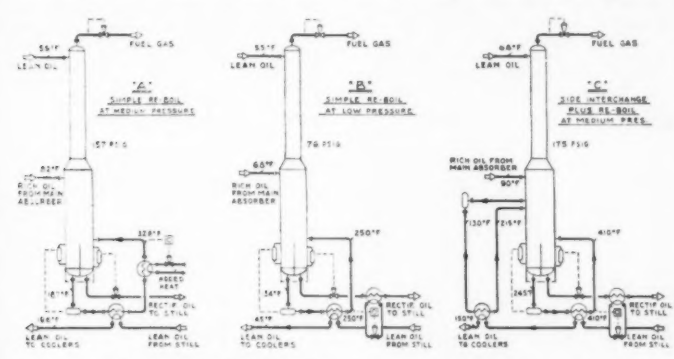
Fig. 1, make a detailed comparison impracticable. However, note the distinct improvement in the two-stage cycle. For main-absorber propane recoveries of the same order, only half as much compressor horsepower and less than half as much reabsorber lean oil was required by the two-stage still cycle to equal the stock-tank recovery of absorbed propane obtained with the single-stage still cycle.

When Use Rich-Oil Rectification

THE two-stage stripping cycle falls off rapidly in recycle-vapor handling efficiency at propane recoveries above 50 per cent due to "compounding" of the accumulator recycle-vapor volumes at the higher propane recovery rates. This results from development of a large propane recycle between the reabsorber and still accumulator.

The answer to the problem of "compounding" is in the distillation removal of all undesired light fractions from the rich-oil stream ahead of the stripping still with a rich-oil rectifier. All absorption-recoverable propane can then be readily retained in the still overhead product at conventionally prevailing accumulator pressures and temperatures. The still condenser can also be operated "totally condensing" with employment of only a single distillation stage.

Rich-oil rectification should be seriously considered whenever it is desired to effect a "net" stock-tank propane recovery in excess of 50 per cent.



PROCESS-FLOW COMPARISONS

		A	B	C
MAIN ABSORBER PRESSURE	PSIG	553	360	450
MAIN ABSORBER OIL RATE	Gal. LO/MCF RG	11.2	28.4	15.6
MAIN ABSORBER RECOVERY OF PROPANE	Pct.	59.3	88.1	65.0
RICH-OIL RECTIFIER RETENTION OF PROPANE	Pct.	91.6	96.4	88.0
NET OVERALL PROPANE RECOVERY	Pct.	54.3	85.0	57.5
RE-ABSORBER / MAIN-ABSORBER LEAN OIL	Pct.	21.4	49.2	12.5
"R.O. FROM ABS.-L.O. TO COOLER" APPROACH	°F	114	77	80

Fig. 3—Interchanger arrangements for rich-oil rectification. Column "A"—conventional base-heated rectifier operating in the upper range of normally employed reabsorption pressures. Column "B"—similar conventional unit operating at a low reabsorber pressure. Column "C"—typical "side-stream" heat interchanged unit operating in the upper reabsorber pressure range.

Cycle development.—Earliest rich-oil rectifier designs employed simple reboil-heat units such as described by Whistler.[1] The major heat supply was from hot lean oil, but at temperature levels such that large amounts of low-level heat had to be discarded from the lean oil at the lean-oil water coolers when operating at the higher, more efficient reabsorber pressures. Operating at lower reabsorber pressures to conserve this low-level heat, on the other hand, required employment of undesirably high reabsorption oil circulation rates. Later, the rectifier "side stream" heat-interchange cycle[2,3] was developed as a solution to the uneconomic alternates of these two earlier simple reboil cycles.

Cycle comparison.—Fig. 3 presents comparative key process data for these three rich-oil rectifier cycles. These data cannot be directly compared down to the last detail due to variations in main absorber operating pressure, quality of rich oil undergoing rectification, and over-all propane recovery, but they do illustrate clearly the relative lean-oil heat-recovery characteristics. One of the best yardsticks for this comparison is the temperature "gap" between the lean oil going to the water coolers and the rich oil from the main absorber.

In summary (referring to Fig. 3):

Column A.—Poorest heat recovery. Added heat had to be obtained from outside source to provide proper "trimming" temperature control on rectifier reboiler.

Column B.—Improved heat recovery. Additional heat could be recovered from lean oil by heat interchange with rectified rich oil. But low reabsorption pressure making this heat recovery possible called for an undesiably large reabsorber oil rate.

Column C.—Highest heat recovery. Simultaneously operated at highest reabsorber pressure and lowest reabsorber oil rate.

Secondary "Trimming" Controls

EARLY rich-oil rectifier designs relied on simple adjustment of the reboiler temperatures to control degree of cut between overhead-rejected light fractions and absorption-oil retained heavier components. When applied to the daily cyclic change in plant-intake quality encountered in most absorption plants, however, this simple control often proved inadequate—particularly for plants operating in the upper propane-recovery ranges. As a consequence, various secondary "trimming" controls have been added to the primary reboiler-temperature control for effect-

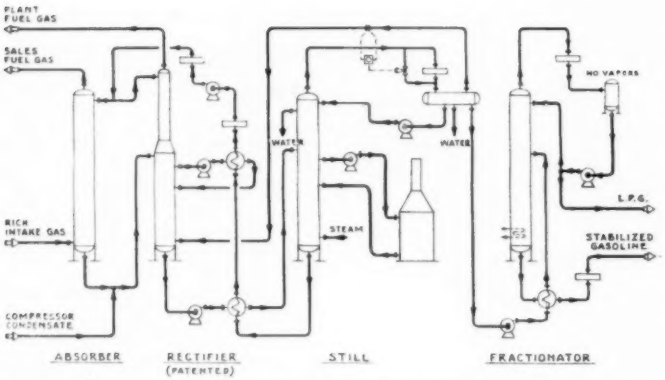


Fig. 4—Production of specification L.P.G. with varying quality intake by direct adjustment of rectifying vapor rate-of-flow.

ing these precise secondary adjustments required to keep the rectifier operation in step with daily cyclic changes in plant-intake quality. The following are currently employed in one or more plants with which the writer is familiar:

1. Recycling of uncondensed vapors from the stripping-still accumulator back to the rectifier reabsorber.
2. Recycling of a stream of depropanized liquid from a product fractionator back to the rectifier.
3. Adjusting of the main absorber lean-oil rate to hold a constant propane or isobutane absorption factor at the main absorber.
4. Adjusting the pressure carried on the rich-oil rectifier.
5. Adjusting the lean-oil rate to the rectifier reabsorber.
6. Adjusting the rate of rectifying-vapor flow into the rectifier base.

Direct Vapor-Flow Control

If the variation in plant intake quality is not extreme, precise control of final light-product quality can be readily obtained by holding the rectifier reboil temperature substantially constant while maintaining either fixed oil rates, or constant "lean oil-gas" ratios, at the main absorber and rectifier reabsorber. The volume of rectifying vapors employed at the rich-oil rectifier can then be adjusted by direct measurement and control of said vapor volume to compensate for the daily cyclic changes in plant-intake quality.

An excellent example of a rectifier operation employing such a direct vapor-flow control is presented in Fig. 4, in which the vapors introduced into the rich-oil rectifier are obtained from the still-product accumulator by aid of a flow-controller operating to regulate the temperature of the production stream entering the accumulator.

In one operation with this equipment, a maximum amount of butanes-plus are recovered at the absorber, and the resultant still-product separated at a single fractionator into a 15.0-15.5 lb. stabilized gasoline bottoms and a 100 or 125-lb. L.P.G. overhead. The amount of absorption oil employed with this operation to achieve maximum recovery of butanes at the main absorber is such that the amount of propane simultaneously recovered is more than can be blended into specification L.P.G. with the butanes remaining from the production of 15.0-15.5-lb. gasoline. As a consequence, a portion of the absorbed propane has to be discarded overhead at the rich-oil rectifier. Employment of the indicated "measured" rectifying-vapor volume control has made it possible to so precisely adjust the quantity of propane thus discarded that an extremely close control can be maintained on the vapor pressure of the resultant L.P.G. product. In fact, with this particular control the plant in question finds no difficulty whatever in regularly holding its L.P.G. shipments within plus or minus 1.5-2.0 lb. of their specification mean.

Referring to Table 1, which presents pertinent operating data from this unit, note that with most operating conditions remaining substantially constant during a given test period, a 7-lb. variation in the L.P.G. vapor pressure resulted in only a 3° F. temperature difference in the rich oil leaving the rectifier base—which small temperature difference was obviously outside the range of practical intermediate adjustment.

On the other hand, the volume of rectifying vapor introduced into the column base over the same period changed from 1,700 to 1,425 M.c.f. per day. This variation was large enough to permit precise intermediate adjustment for production of a range of vapor pressures between the 118-lb. and 125-lb. figures of the table.

Dual Control

Cases where cyclic changes in plant-feed quality are extreme often require a coordinated readjustment of the rectifier bottoms temperature along with secondary control adjustment. A simplified flow sheet of a plant installation employing such a

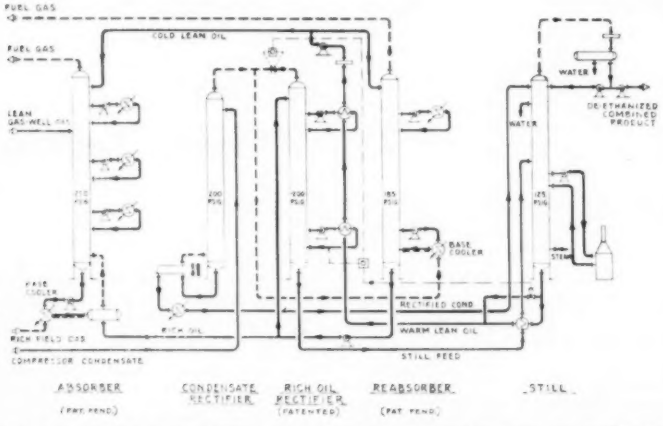


Fig. 5—Production of specification propane with varying quality intake by combination adjustment of reboil temperature and vapor flow.

TABLE 1
Rectifier Control Changes Vs. L.P.G. Quality for Flow-Diagram Operation of Fig. 4

Rich gas to main absorber, M.c.f. per day	9,775	9,600
Compressor condensate to rich-oil rectifier, g.p.m.	6.2	6.2
Rich-oil rectifier pressure, psig.	98	97
Lean oil to rich-oil rectifier reabsorber, g.p.m.	35	38
Fuel gas out rich-oil rectifier reabsorber, M.c.f. per day	900	770
Rich oil out side exchanger, °F.	190	190
Rich oil out rich-oil rectifier base, °F.	179	182
Vapors into rich-oil rectifier base, M.c.f. per day	1,700	1,425
L.P.G. vapor pressure at 100° F., L.P.G. bomb	118	125
Stabilized gasoline vapor pressure at 100° F., Reid	15.2	15.2

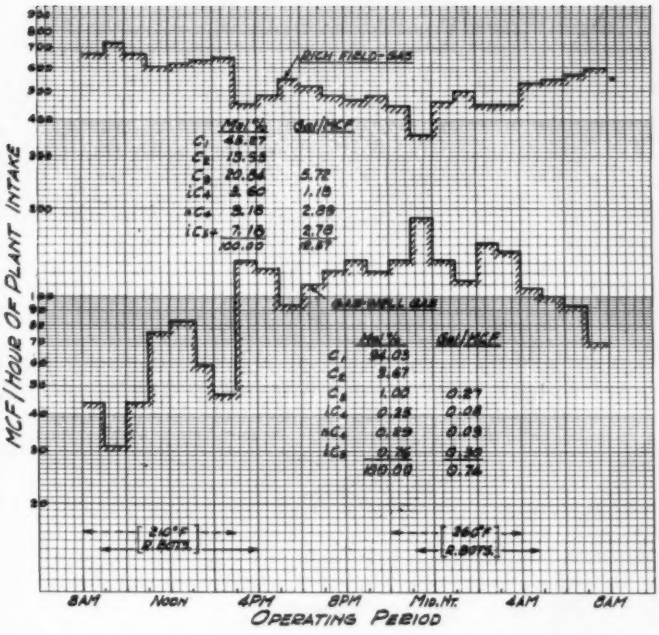


Fig. 6—Rectifier bottoms temperature versus changes in plant intake quality. This is a characteristic 24-hour plant-intake record for the unit of Fig. 5.

dual control is presented in Fig. 5. This plant handles two streams of intake gas of widely different composition, namely, streams having concentrations of propane and heavier of some 12.50 gal. per M.c.f. and 0.75 gal. per M.c.f. A specially cooled absorber is employed for handling the two gas streams, with the rich-gas stream being introduced into a base cooler associated with the bottom section of the column while the lean-gas stream is introduced near the top of the column. Oil-circulation rates are maintained at a constant "lean oil-lean gas" ratio with an appropriate ratio controller.

Gas-rate variation.—Fig. 6 presents a characteristic 24-hour plant-intake record for this unit from which it will be seen that the rich-gas intake rate may vary more than twofold, and the lean-gas intake rate more than sixfold, over a 24-hour period. By appropriate interlocking of temperature and vapor-flow controls at the rich-oil rectifier while holding a constant "lean oil-lean gas" ratio at the reabsorber, it is possible automatically to compensate for the extreme range of plant-intake quality represented by the flow volumes of Fig. 6 while consistently producing extra-high yields of close-specification quality propane (i.e. 95 per cent propane absorption followed by a 95 per cent rectifier retention of propane containing not over 4 per cent ethane).

Due to the mechanical arrangement of the equipment in question, it was found more convenient to control the rectifier on the basis of the vapor volumes leaving the top of the rectifier rather than the vapor volumes entering the rectifier base. The interlocking control of the unit consists of a vapor-flow controller on this stream arranged to reset a temperature controller adjusting the heat supply to the rectifier reboiler.

Operating experience.—From cut-and-try experience, it has been determined that for intermediate mixtures of plant-intake streams in the volumes normally encountered, maintenance of a vapor flow from the rectifier in the amount of 4.5 to 5.0 units on the flow-controller chart will produce a finished propane product containing not over 4.00 per cent of ethane. By similar experience, it has also been determined that the rectifier bottoms cannot be allowed to drop below 210° F., and need not be heated above 260° F., for maintenance of this ethane specification irrespective of the resultant volume flow of vapors from the rectifier.

On the basis of these experimentally derived control factors, therefore, the interlocking "vapor-flow, bottoms-temperature" controls are adjusted so that the vapor controller will reset the temperaure controller to maintain a vapor flow beween 4.5 and 5.0 units on the flow chart between temperature limits of 210° and 260° F.—while

(Continued on page 121)

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but **FIVE**
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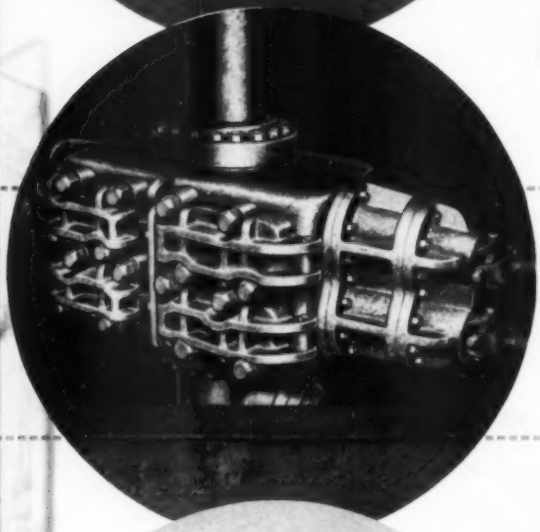

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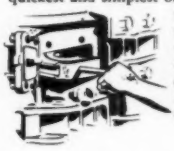

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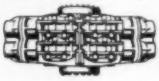

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Critique of present methods used in

Determining Interstitial Water Saturation

by H. I. Meyer*

Some are sound, some have limited value, some are entirely unsatisfactory, and some are not used to best advantage, the author believes

THE purpose of this paper is to discuss interstitial water and the methods used to determine its concentration. It is intended as a review of the work done in this field, both theoretical and experimental. An attempt has been made to present a representative bibliography of the more recent work done on this subject. The controversial nature of the experimental work now being done on interstitial water emphasizes the need for such a survey. There are at present at least five methods used to determine water saturation in reservoir rock.

The reasons for the development of these various techniques may be seen by presenting a short historical sketch of the development of this phase of reservoir analysis and by considering the elements of the underlying theory. The merits of the proposed methods are discussed purely on the basis of their mathematical and physical validity in the light of present theory. The questions of simplicity and reproducibility are not stressed. This is amply done by the proponents of each technique.

In any formation of known properties (porosity, permeability, etc.), a probable distribution of interstitial water may be determined from purely theoretical considerations without any laboratory analysis being made (see Figs. 4 and 5, Reference 26). Such determinations are of little use when applied to a specific formation where one wants not a probable but the actual distribution of this water.

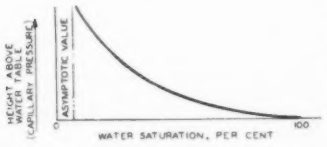


Fig. 1.

Capillary pressure-water saturation curves for all reservoir formations have several broad features in common as illustrated by the typical curve (Fig. 1). This shows a vanishing value of capillary pressure at the water table, a rapid initial fall in water saturation as the elevation (capillary pressure) is increased, and then an approach to a vertical asymtote of water saturation (irreducible water) as the capillary pressure is increased further. Curves of this general type which represent functional relationship between two variables are not unique to the interstitial-water content of cores, but are common to many types of physical measurements, e.g., Boyle's law for gas volume, pv = constant. It is thus not sufficient proof of the value of an experimental technique alleged to give interstitial-water contents that it shall consistently reproduce results known to be reasonable. Such reproducibility is only significant if the testing method may be related to interstitial-water content by valid principles.

Interstitial Water-Theory and Definition

Interstitial water is that water which is initially found in the pores of petroleum reservoirs. It may be assumed to be the residual of the water which was originally in the sedimentary formation when it was laid down, i.e., residual of the connate water.

In general there will be two well-defined strata in the reservoir, one well above the water table where the residual water left after drainage will occupy a constant per cent of the pore spaces, which is referred to as the irreducible saturation; the other well-defined region will be below the water table where the saturation may be considered to be 100 per cent. Between these two zones there will be a transition region where water will be present due to capillary rise. Only in this transition zone is the concept of capillary pressure defined.[25]

A convenient definition of capillary pressure as a function of height above the water table is the difference in pressure across a water-oil (or gas) interface in hydraulic contact with the free water which (possibly) occurs at the height. There are other definitions equally valid, e.g., the capillary pressure is equal in magnitude to the hydrostatic pressure which would occur at the base of a column of water standing to that height. This is a deceptive definition since capillary pressures exists only at an interface, and in fact it completely cancels out the static pressure at the water table itself.

Any definition of capillary pressure as a function of a curvature of the liquid interface will lead to difficulties since it may not then be correlated to height above the water table. Such a concept seems to have led to the difficulties pointed out recently by Muskat[23] although some of the paradoxes he indicated may be explained by variation of contact angle.

The amount of water present in the transition zone will probably be approximated by the reverse process of a dry formation soaking up water by capillary attraction. The distribution of the water will not be exactly the same because of various hysteresis effects which are discussed in detail in the next section. Plots of such data are usually referred to as imbibition curves. Thus the distribution of water in this transition zone is probably fairly independent of the geologic history of the formation.

The irreducible saturation will in general consist of water held by two different types of forces: (1) capillary forces which will create pendular rings, etc. (Fig. 2, of Reference 26). This type has been treated. (2) Water which will be held in a thin layer on the surface by adhesion; this type has been largely ignored, (Messer[27] is an exception). The adsorbed layer will be held on the surface by the dipole potential of the water molecules, and its thickness (number of molecules) will be determined by the induced polarization of successive layers.

This theory seems to have been introduced by DeBoer and Zwicker and has been extended by Brunauer, Emmett, and Teller.[14] If the thickness of the adsorbed layer were determined following their method, only the total specific surface area of the media would have to be known to determine the irreducible water held by this mechanism. The surface-area problem has been treated by Carman[28] and by Emmett and Brunauer[29] using different methods. These adhesive forces are immensely stronger than the ordinary capillary forces and so water held by them may be expected to behave differently under experi-

*Research mathematician, United Gas Corp.

mental conditions, e.g., in a centrifuge.

Theory of Surface Tension

Surface tension has been studied for years by mathematician and physicist. It is only well enough understood so that its behavior in limiting cases is predictable. This phenomenon may be most reasonably considered as one of surface energies. The very existence of an interface between two materials involves free energy. The amount of this energy is dependent on the nature of the interface and is a direct function of the area involved. In this paper γ will be used to denote surface energy per unit area and subscripts are used for further identification.

At an intersection of three materials an equilibrium state may exist which will minimize the surface energy involved. For our purposes it will suffice to consider contact angles (δ) which we define as the angle of contact at equilibrium from the solid surface to the fluid-fluid surface through the material in question (see Fig. 2). The equation for this angle

Fig. 2.

as derived in References 1, 2, 4, and 7 is:

$$\gamma_{ws} - \gamma_{os} + \gamma_{wo} \cos \delta = 0$$

According to this equation if γ_{ws}, γ_{os}, and γ_{wo} were determinable, the contact angle would have one definite value. Unfortunately this is not possible. The contact angle may vary through a range of values, but just why it will assume one value or another is not fully understood.* This so-called hysteresis may be of some importance in considering the irreducible water saturation. Consider for example an isolated (not in contact with free water surface) globule of water held in position solely by surface tension forces.

The water of mass m is held in equilibrium against the force of gravity by the variation of the slope of the interface between the oil and water at its line of contact with the solid rock. This variation will be due to a combination of the change in inclination of the solid along this line plus a variation due to hysteresis in the contact angle.

In general the contact angles at the bottom of the water will be larger than those at the top (see Fig. 3). Expressed mathematically, if ϕ is the angle between the surface at contact and the vertical direction then the force, $mg = \int \cos \phi \, (s) \, \gamma_{wo} \, ds$, integrated over the complete line of contact of the whole isolated water mass with the rock (not necessarily a connected curve).

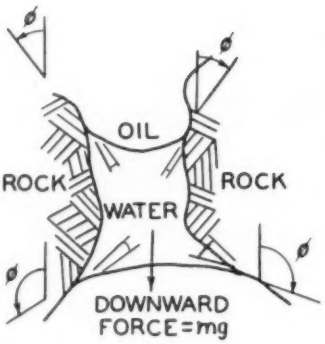


Fig. 3.

*See Burdon,[4] pp. 72-73; Arams,[1] p. 180, especially Footnote 1; Bikerman,[2] pp. 253-257. The difference is more pronounced on rough surfaces (e.g., on surfaces in natural cores).

General Methods

The methods of determining interstitial water in a reservoir fall into two general classes. The first involves the actual measurement of water content in the reservoir itself, either by analysis of cores cut at different depths or by the measurement of properties of the formation (e.g., resistivity) in situ. Apart from the method of interpretation of electrical logging data, we shall not undertake a detailed discussion of these methods. They are covered in the general References 5 and 6. All these methods have inherent inaccuracies, with the possible exception of the method of measuring water in cores drilled with oil-base drilling fluid as described by Schilthuis,[25] preferably brought to the surface in a pressure core barrel.[12 23] A recent account of oil coring is given by Edinger.[22] Comparison of interstitial-water saturation determined by another method with data obtained from oil cut cores is considered the most reliable check on the method.

The second class of procedures to determine interstitial water content involves a small scale duplication of what is presumed to have happened in nature by means of laboratory experiments with cores taken from the formation in question. For convenience these methods are referred to as synthetic methods, and we shall consider them in detail in the next section. Before taking them up, however, we shall consider the method which employs data obtained from resistivity logging of oil wells.

Resistivity method.—In 1941 Archie[3] presented a method of investigating water saturation of a reservoir by interpreting the resistivity measurements of the reservoir rock as obtained from usual logging practices. He developed empirical relations and defined at least one term, formation factor, the ratio of the resistivity of a brine-filled core to the resistivity of the brine itself, which has become part of the petroleum engineer's vocabulary. This was a provocative paper rather than an attempt to give a finished technique. In a later paper[31] he presented extensive field data and some resistivity - saturation correlations. Dunlap, Bilhartz, Shuler and Bailey[21] later pointed out some of the difficulties of interpreting resistivity logs to determine water saturation.

These accumulated field data showed that the simple relation proposed by Archie to determine water saturation was an oversimplication.

Patnode and Wyllie[31] pointed out that the implied assumption that the rock matrix is nonconducting is not always admissible. Retaining Archie's definition of formation factor (F), they pointed out that the presence of conducting material in the rock matrix makes F a function of the resistivity of the electrolyte (brine or drilling mud). The problem is now being enthusiastically investigated by de Witte who has recently presented a series of papers dealing with the theoretical aspects of resistivity as a function of fluid saturation.[17 19] He considered the effect of mud infiltration on resistivity[17] and later extended Patnode's work on the influence of rock conductivity. De Witte pointed out inconsistencies in earlier theoretical developments and presented an expression (Reference 18, Equation 20), which must be considered to be the best relation now available for expressing saturation as a function of measured resistivity. He ingeniously defines formation factor as applying only to the nonconducting part of the rock matrix, and as such it may be considered an invariant property of a given rock.

This method seems to represent a highly promising approach to the problem of determining interstitial water concentration. Although de Witte discusses the possibility of determining water saturation from electrical logging data only, cores must be cut and their electric properties examined in order to interpret the data with any confidence. The most obvious need, in our opinion, is a collection of analyzed field data whose computed saturations are compared with those actually determined from oil cut cores.

Patnode's, de Witte's and much of Archie's work was done under laboratory conditions. Williams[29] points out that laboratory resistivities may vary widely from that determined from the field data. These deviations may even be inherent in usual logging practice. In any event the resistivity method has the tremendous advantage of measuring interstitial water in situ and seems well worth continued investigation.

Synthetic Methods of Determining Interstitial Water

Early considerations.—Having decided that one knows how the interstitial water got into the rock in the first place, i.e., by gravity drainage as oil displaced water in fully saturated rock, the logical procedure to duplicate the process would be to construct a long column of reservoir rock, fill it with water, fill the space above it with oil or gas, and let it drain. This would be an inconvenient experiment. Leverett[26] did the next best thing; he attempted to express the residual saturation as a function of one dimensionless parameter:

$$(\Delta\rho\, g\, h/\gamma)\ (K/\phi)^{1/2}$$

where:

- h = height above the water table
- g = acceleration due to gravity
- γ = surface energy of the fluid-fluid interface
- $\Delta\rho$ = difference in fluid densities
- ϕ = porosity
- K = Darcy permeability

He interpreted the data he obtained using packed sand in columns up to 10 ft. long to evaluate this function (since dubbed the J or j function) which he hoped would apply to any porous structure. Leverett was a careful worker. He found that his curve was consistent only for clean sands and thus showed a limitation of his method. He also observed the difference between drainage saturation and imbibition saturation, which must be attributed both to hysteresis of contact angle and also to the fact that in imbibition the upper zone is not wet at all. Curiously, he mentioned a hysteresis only in the transition zone although his data clearly show the difference in the upper zone.

"Restored state" or "disk" method. The development of the next method was a logical step. Not being able to construct the tall columns of reservoir rock mentioned in the last paragraph, the early investigators were led to consider only a small slug (core) in the column and to represent the part below by inducing a negative pressure in the pores at the bottom of the sample. This negative pressure must act only in the pores of the rock, not on the core as a whole. This representation may be approximately achieved by establishing capillary contact between the core and a slightly permeable membrane and by creating a pressure difference across that membrane less than the pressure required to bypass gas through the wet membrane itself (displacement pressure). Whether this is achieved by increasing the pressure in the core chamber[20, 30, 12] or by creating a vacuum below the membrane[28] is immaterial.

The method is competently treated in general texts (Reference 6, pages 255-269; Reference 5, Sections 3, 11). It is used at present in most core laboratories to simulate water distribution in the transition and upper zone. End effects at the membrane or "disk" are usually ignored. Considering our inadequate knowledge of surface tension, the customary practice of displacement by air rather than reservoir fluid seems questionable. Calhoun, Lewis, and Newman[15] give experimental data which seem to support this objection.

The disk method is reported to be a somewhat time consuming and a fairly difficult procedure, but it does have a justifiable physical basis. Comparison made between interstitial-water content determined in this way and that determined from oil cut cores have shown fairly good agreement.[12, 33]

Centrifuge methods.—The difficulties of the restored-state method led to various attempts to develop simpler experimental techniques. The first and possibly most obvious step was to use a centrifuge to increase the gravity force. Hassler and Brunner[21] seem to have been the first to employ one to measure capillary pressures in reservoir rock (the centrifuge has been used for years in soil mechanics). It has been taken up again in a recent paper by Slobod, Chambers, and Prehn,[36] and since the stated purpose of their report is to establish the practical value of the

centrifuge method, we shall consider it in some detail.

The technique described in their paper is completely useless in determining irreducible water saturation. As pointed out in an early section this saturation will be composed of isolated water held in equilibrium against gravity by adhesive and surface forces. These surface forces will not increase as the gravity force is increased. Consider for example water held purely by surface tension forces as described in the section on theory of surface tension. We had an equation of the type:

Force = mg = (cosine: dimensionless) (surface energy: force/unit area) (total area: length squared).

To make this expression dimensionless we divide both sides by any fixed reference force F. Then:

Mg/F = (1/F) (dimensionless quantity) (force unit area) (total area of surface).

In any valid model of the reservoir, e.g., a core in a centrifuge, this dimensionless equation must remain true.[2] Consider the described procedure: the left-hand side of this last equation increases in value with increase in g while the right-hand side remains unchanged since they use the same fluid and core. In simpler language, much of the "irreducible" water will be thrown out of the core by centrifugal force.

Before suggesting any remedy let use consider the other phase of the problem, the determination of water content in the transition zone. The forces to be considered now are capillary pressures. Slobod et al compute the average specific force acting on the fluid in the core, and then claim that the fluid content of the core will correspond to a core in the reservoir at a height where the capillary pressure is equal to this force per unit area. This correspondence is wrong. In their experimental technique the "bottom" of the core will have zero capillary pressure by definition. The only centrifugal effect will be an increase of the effective mass of the fluid, an analogy to the situation of comparing a mercury manometer to a water manometer—in either case zero readings indicate atmospheric pressure. The simple diagram, Fig. 4, may illustrate this point.

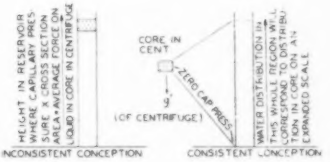
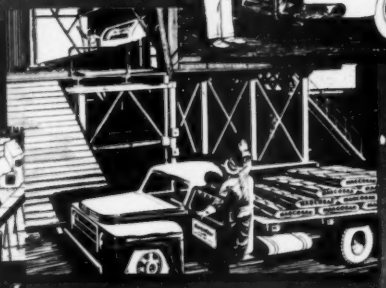
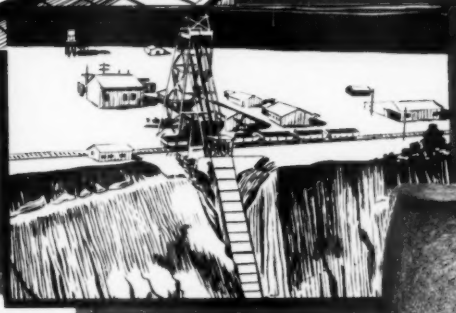


Fig. 4—Model of gravity effects in centrifuge.

Properly used, the centrifuge may have some value in determining interstitial water concentrations. It seems as if the dimensions involved in determining the distribution in the transition zone and in the irreducible zone are incompatible for this treatment; therefore, at least two types of experiments would have to be performed. Hassler[10] recognized this limitation. Adapting the usual method, the imbibition curve could be obtained either by taking careful measurements along the core (of, e.g., resistivity[9]), by proper algebraic treatment of average value data, or by setting the core on other porous plugs to represent lower portions of the reservoir. The irreducible water concentration might be obtained by using a fluid of higher surface energy to take care of dimensional similitude. The use of another fluid is, of course, of questionable value as mentioned before.

Mercury-injection method.—In 1945 Ritter and Drake[9] published a method of determining pore-size distribution by injecting mercury into a porous sample against surface-tension forces and recording the volume injected at different pressures. This method has been used to simulate water drainage where mercury-vacuum interfaces correspond to the gas or oil-water interface in reservoir drainage. This method has been reported in recent papers by Purcell[8] and Brown;[11] the one important ratio involved is: mercury to vacuum capil-





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lary pressure versus oil or gas to water capillary pressure.

Our present knowledge of surface effects is not sufficient to permit us to relate the mercury capillary pressure measurement to water capillary pressure. There is an even more basic defect in this treatment. In the centrifuge method we saw that zero capillary pressure must occur at the base of the sample, but where does it occur when mercury is injected from the outside? The answer is, somewhere in the interior of the sample. The interpretation of the laboratory data thus presents some difficulty.

Evaporation method. — Another method of determining irreducible water saturation was recently presented by Messer.[h] He interprets data obtained by evaporating water from a saturation core. The high point of this paper is his Equation 7. The following is an expansion of his brief mathematical treatment. His original equation numbers are retained.

Expressing the diffusion of water vapor from the surface of the fluid to the outside by a single diffusion coefficient D, which is assumed to be constant for a sufficiently short period of time, we may write:

$$Q_m = D\,[P(t) - P_o] \qquad (1)$$

where:

Q_m = mass flow in grams per second

$P(t)$ = vapor pressure at the liquid surface, at time t

P_o = vapor pressure of the outside atmosphere

In any isothermal, constant volume reaction of a perfect gas the differential expression for free energy is:

$$dF = VdP = \frac{nRT}{P}\,dP$$

The number of moles n equals m/M for a mass m of molecular weight M, so that:

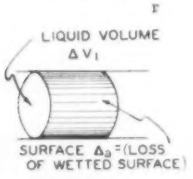
$$-\Delta F = -\int_{t_o}^{t_o+t} dF$$

$$= \frac{m}{M}\,RT\,\ln\frac{P(t_o)}{P(t_o+t)} \qquad (4)$$

where t_o is a fixed time.

The free energy involved, assuming circular pores, is:

$$\Delta F = \gamma\,\Delta a = -\frac{2\,\Delta V_l}{r}\,\gamma \qquad (5)$$



Equating (4) and (5):

$$\ln\frac{P(t_o)}{P(t_o+t)} = \frac{2\,M\,\gamma}{\rho\,RTr} \qquad (6)$$

where $\rho = m/\Delta V_l$ is the density of the liquid.

Using Equations 1 and 6, we obtain:

$$\frac{d^2m}{dt^2} = \frac{dQm}{dt} = D\,\frac{dP}{dt} = DP(t_o)$$

$$\times\frac{2\,\gamma\,M}{\rho\,RTr^2}\,[\exp\,-\,(2\gamma M/\rho RTr)]\,\frac{dr}{dt} \qquad (7)$$

This equation is the basis of his further work; it has the integral:

$$dm/dt = Q_m = DP(t_o)$$

$$\times\exp\,(-\,2\gamma M/\rho RTr) + \text{a constant} \qquad (7a)$$

Now he argues as follows: at irreducible saturation the radii of the menisci remain constant; therefore, $dr/dt = 0$ and the right-hand side of Equation 7 vanishes; therefore, Q_m is a constant at this point. All one has to do to find the irreducible saturation is to plot mass flow as a function of time; and where the line becomes straight, the remaining volume in the core is the required saturation (his Figs. 2, 3, 4). Consider this statement more critically: the radii of the menisci are not decreasing, but fluid is still leaving the core. No mathematician would venture to state where a curve which is asymtotically approaching zero becomes "essentially" straight. To get around this last difficulty, he announces that the "best" fit that may be made to the plotted data is that:

$$Q_m = bV(t_o)\,e^{-bt}$$

where b is an arbitrary constant.

But we already have an expression for Q_m, Equation 7a (not in the original paper). Comparison of these two expressions shows that his best fit amounts to precisely the assumption that t is inversely proportional to r. In his succeeding analysis he derives this relation (Equation 11). He has proved his assumption.

In view of this lack of mathematical elegance coupled with some doubt as to the validity of using thermodynamics relations for a nonsteady-state process, his argument seems insufficient either to support or deny his fundamental assumptions. The concept that there is an analogy between the displacement of water by oil in a reservoir formation and the drying out of a core by exposure to the atmosphere is extremely difficult for us to accept.

Discussion and Conclusion

After making this preliminary study and evaluation of the methods now employed to measure the interstitial water content of reservoir wells, we arrive at the following conclusions concerning the value of the various methods:

Restored - state or disk method.— This is basically sound although some improvement in experimental technique seems indicated for this method. It is considered the best technique currently in use.

Centrifuge method.—The centrifuge has not been used to best advantage in reported tests. Different experimental methods are necessary in order to obtain pertinent data from its use.

Mercury injection method.—As used in reported work we can see limited value in this method. Possibly it might be more useful by employing a low-permeability disk as in the restored-state method.

Evaporation method.—We consider this to be an unsatisfactory method for determining the amount of interstitial water.

Resistivity method.—Fundamentally this seems to be the soundest approach of any. Unfortunately much more work, both in the laboratory and in the field, is needed to develop it.

The two most common errors in experimental work seem to come from confusing capillary pressure with force in general and from ignoring proper similitude relations. Care of experimentation and collection of data, even if reproducible, are of no value if the experimental technique is not based on sound physical principles.

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Checking Heat-Exchanger Performance

(Continued from page 105)

Problem.—Design a heat exchanger to heat 100,000 lb. per hour of an organic liquid containing 20 per cent acetone and 80 per cent acetic acid from 30° C. to 100° C. by cooling 80,000 lb. per hour of 100 per cent acetic acid from 140° C. to 50° C. Pressure drop on tube side not to exceed 5 psi. and pressure drop on shell side not to exceed 12 psi. Material of tubes to be copper.

Solution procedure.—First, enter on computation sheet previously determined values. Next, obtain various factors from alignment charts and carryout calculations as necessary factors are obtained.

Values obtained from Fig. 2 are entered on Line 14, Columns B and C. Enter on Line 20, Column B values for F_w, Fig. 3. Work factor for shell side, F_{w_s}, is obtained from Fig. 4 and entered on Line 20, Column C.

The value for F_M is from Fig. 5. This is placed on the computation chart on Line 28, Column B. Fig. 6 is used to obtain F_{Mo} which value is placed on Line 28, Column C. On Line 46, Column B, place value for f_{pp} obtained from Fig. 7. The value for f_w obtained from Fig. 8 is entered on Line 48, Column B, and that for f_{m_t}, Fig. 9, is entered on Line 55, Column B.

Values on Line 32, Columns B, C, and D, are completed as indicated on tabulation sheet, as are those in Column E, Lines 34, 36, and 38. Also computed are the values for Lines 46, 48, 50, 52, 54, and 58, Column B. Other calculations are carried out for the values on Lines 46 and 48, Column C, and for Line 58, Columns B and C.

Symbol	Designation and units
C_p	Specific heat of tube side fluid—B.t.u./lb./°F.
d_o	Outside diameter of tube—in.
d_i	Inside diameter of tube—in.
D_s	Inside diameter of shell—in.
F	Factor for correcting temperature difference—a decimal
F_{MD}	Mechanical design factor—none
F_n	Numerical factor—none
F_p	Physical property factor—none
F_s	Physical property factor, shell side—none
F_t	Physical property factor, tube side—none
F_w	Work factor—none
f_{m_d}	Mechanical design factor for pressure drop—none
f_{pp}	Physical property factor for pressure drop—none
f_w	Work factor for pressure drop—none
h	Coefficient of heat transfer for fouling material—B.t.u./hr./sq ft./°F.
k	Thermal conductivity of tube wall—B.t.u./hr./ft./°F.
K	Abscissa of ΔT correction factor chart—none
L	Total series length of path on tube side—ft.
L_s	Length of shell or length of single tube pass—ft.
M	Molecular weight—lb./mol
M_d	Mechanical design factor—none
n	Number of tubes in parallel—none

N_{PT} Number of passes tube side—none
P Pitch or spacing of baffles—in.
ΔP Pressure drop—psi.
R Parameter of ΔT correction factor chart—none
s Specific gravity, relative to water—none
T_{av} Average fluid temperature shell side—°C.
T_H High temperature, shell side—°C.
T_L Low temperature, shell side—°C.
t_{av} Average fluid temperature, tube side—°C.
t_H High temperature, tube side—°C.
t_L Low temperature, tube side—°C.
dt Temperature change in fluid, tube side—°C.
dT Temperature change in fluid, shell side—°C.
ΔT_H High-temperature difference—°C.
ΔT_L Low-temperature difference—°C.
ΔT_{LM} Log mean-temperature difference—°C.
ΔT_M Corrected mean-temperature difference—°C.
W_t Rate of flow, tube side (thousands of lb./hr.)—M lb./hr.
W_s Rate of flow, shell side (thousands of lb./hr.)—M lb./hr.
z Viscosity of fluid—centipoises

Drilling at Meadow Creek

(Continued from page 93)

non sand wells. These rigs are equipped with a 400-hp. draw works powered by two 225-hp. gas engines. One 7¼ by 14-in. slush pump powered by the draw-works engines through the compound is used. A 126-ft. jackknife derrick with 6 or 8-ft. structure is erected. Drill pipe is 4½-in. o.d. 16.6-lb. Drill collars used measure 6¼ in. o.d. by 30 ft. Manually operated blowout preventers are used.

Casing program.—A string of 9⅝-in. surface pipe is used and set at a depth of 175 ft. Hole size for the long string is 8¾-in. in which is run a string of 5½-in. o.d. pipe.

Where the Sussex sand is productive, it is found that the Shannon sand is also a potential reservoir. Most of the Sussex locations are drilled to the Shannon sand.

Pipe is set on top of the Shannon sand. Wall scratchers are spaced 15 ft. apart from the shoe up 600 ft. and centralizers are spaced 90 ft. apart over the same interval.

TABLE 3—ANALYSIS OR RIG TIME: SHANNON SAND WELL, SUSSEX AND MEADOW CREEK FIELDS, JOHNSON COUNTY, WYOMING

	Rig-labor days basis					
	Footage		Day work		Total	
Operation—	Days	Per cent	Days	Per cent	Days	Per cent
Move in and rig up	1.62	.191			1.62	.125
Tear down	.66	.078			.66	.050
Drilling bit on bottom 4,118 ft.	2.08	.244			2.08	.160
Coring bit on bottom 50 ft.			.56	.124	.56	.043
Trips—total number 12	.43	.051	.70	.155	1.13	.087
Run casing	.65	.077			.65	.050
W.O.C. (casing only)	3.00	.354			3.00	.231
Straight hole tests						
Mix mud			.27	.060	.27	.021
Test prior to oil string			.60	.133	.60	.046
Complete and test after oil string			2.34	.517	2.34	.180
Trouble, repairs, and delays:						
Fish (incl. trips)						
Stuck pipe						
Lost circulation						
Weather or roads						
Rig repairs						
Rig service	.04	.005			.04	.003
Other						
Total rig-labor days	8.48	*1.000	4.52	*1.000	13.00	*1.000

*Expressed as fractional.

TABLE 4—ANALYSIS OF RIG TIME: SECOND WALL CREEK SAND WELL, SUSSEX AND MEADOW CREEK FIELDS, JOHNSON COUNTY, WYOMING

	Rig-labor days basis					
	Footage		Day work		Total	
Operation—	Days	Per cent	Days	Per cent	Days	Per cent
Move in and rig up	.83	4.9			.83	3.0
Tear down	2.01	11.8			2.01	7.0
Drilling bit on bottom 6,560 ft.	6.28	36.6			6.28	21.2
Coring bit on bottom 147 ft.			1.4	11.0	1.4	4.7
Reaming bit in hole 147 ft.			.5	4.0	.5	1.6
Trips—total number 20	1.72	10.3			1.72	5.8
Run casing	1.62	9.7			1.62	5.4
W.O.C. (casing only)	2.35	13.8			2.35	8.0
Straight hole tests						
Mix mud			1.1	9.0	1.1	3.8
Test prior to oil string			3.2	26.0	3.2	10.8
Complete and test after oil string			6.0	49.0	6.0	20.3
Trouble, repairs, and delays:						
Fish (incl. trips)	.69	4.3			.69	2.4
Lost circulation						
Stuck pipe						
Weather or roads						
Rig repairs	1.33	8.1			1.33	4.6
Rig service	.21	.3	.3	1.0	.31	1.0
Other	.12	.2			.12	.4
Total rig-labor days	17.16	100.0	12.3	100.0	29.5	100.0

Cementing practice.—A total of 250 sacks of cement is used, an amount considered adequate to bring the cement approximately 250 ft. above the Sussex sand. If the well is to be completed in the Sussex, the plug is not drilled and the well is completed by gun perforating.

TABLE 2—ANALYSIS OF RIG TIME: LAKOTA COMPLETION, SUSSEX AND MEADOW CREEK FIELDS, JOHNSON COUNTY, WYOMING
(Total depth: 7,565 ft.)

	Rig-labor days basis					
	Footage		Day work		Total	
Operation—	Days	Per cent	Days	Per cent	Days	Per cent
Move in and rig up	3.96	.130			3.96	.089
Tear down	1.67	.054			1.67	.038
Drilling bit on bottom 7,427 ft.	14.35	.470			14.35	.321
Coring bit on bottom 126 ft.			2.10	.150	2.10	.047
Reaming bit in hole 126 ft.			.57	.041	.57	.013
Trips—total number 47	2.71	.090	3.56	.254	6.27	.141
Run casing	1.23	.040			1.23	.028
W.O.C. (casing only)	2.44	.080			2.44	.055
Straight-hole tests	.05	.002			.05	.001
Mix mud						
Test prior to oil string			2.44	.174	2.44	.055
Complete and test after oil string			5.33	.381	5.33	.120
Trouble, repairs, and delays:						
Fish (incl. trips)	1.50	.049			1.50	.034
Stuck pipe						
Lost circulation						
Weather or roads	.17	.006			.17	.004
Rig repairs and rig service	2.42	.079			2.42	.054
Other						
Total rig-labor days	30.50	*1.000	14.00	*1.000	44.50	*1.000

*Expressed as fractional

Operating Rich-Oil Rectifier

(Continued from page 111)

corresponding "blocks" are set on the temperature controller whereby this unit will automatically maintain said temperature limits irrespective of the volumes of vapor flow developed.

Fig. 7 presents a 24-hour chart record of the vapor flow from this unit, together with an hourly record of the temperature maintained at the rectifier base, for the same operating period covered in Fig. 6. Referring to Fig. 7, it will be seen that from 8:50 a.m. until 3:40 p.m. the equipment operated at a fixed-temperature control of 210° F. on the rectifier base; then in keeping with changing plant intake quality, the control temperature was gradually raised from 210° to 260° F. between 3:40 p.m. and 11:10 p.m. From 11:10 p.m. to 4:45 a.m. the equipment operated at a new fixed-temperature control of 260° F.; thereafter, due to again changing intake quality, the temperature was gradually dropped from 260° to 210° F. by 8:50 the following morning.

In keeping with these temperature shifts, it will be noted that during the

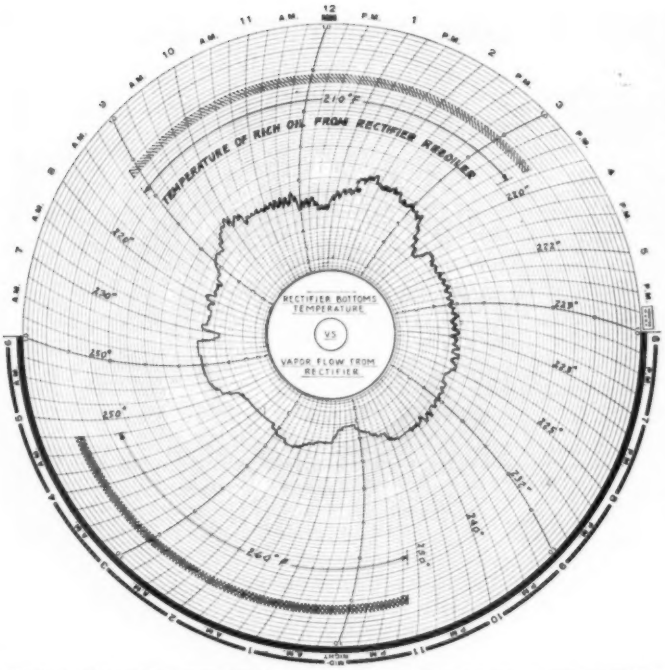


Fig. 7—A 24-hour chart record of the vapor flow from the unit of Fig. 5 together with an hourly record of the temperature maintained at the rectifier base, for the same operating period covered in Fig. 6.

periods of changing temperature the rate of rectifier vapor flow was held largely between 4.5 and 5.0 units, while during the 210° F. operation it rose to a maximum of 6.3 units, and during the 260° F. operation it fell to a minimum of 3.2 units.

For interest in correlating the plant-feed composition with these changes in rectifier temperature control, we have indicated the periods of fixed rectifier temperature by appropriate solid lines on the bottom of Fig. 6. It should be noted that these solid lines are offset with parallel dashed lines by approximately 1 hour; that the dashed lines clearly define periods of maximum and minimum rich-gas intake; and that their 1-hour "offset" from the solid lines represents the time lag of the rich-oil flow through the large surge drum employed to smooth out the plant's operation.

This particular operation is the most dramatic the writer has encountered to date in demonstrating the limitation of the simple base-temperature control for precise adjustment of a rich-oil rectifier operating on a high-recovery propane cycle. This limitation possibly accounts for many of the troubles encountered in the past with certain of these units.

References

1. Fat-Oil Deethanization, A. M. Whistler, C.N.G.A. fall meeting paper, 1946.
2. Fractionating Absorbers in the Petroleum Industry, J. C. Hannah, Petroleum Refiner, August 1949.
3. Ragatz Patent No. 2548058.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

What Is Cracking Reaction?

Everyone says that cracking is a reaction of decomposition and of polymerization. How can you tell how much of each is taking place?—W. I. S.

Although the two major reactions of cracking are decomposition-type reactions and polymerization reactions, others that may be described as isomerization, alkylation, aromatization, etc., also take place to some extent. The amount of each type of reaction is seldom stated because so very many different hydrocarbons are cracked (and as a mixture) that there is no adequate way to keep track of all of them. However, there is one way of judging the over-all reactions of cracking, namely, the amount of heat liberation or absorption during the cracking reaction.

The decomposition in reactions generally require heat or are endothermic as shown in Table 1:

TABLE 1—ENDOTHERMIC DECOMPOSITION REACTIONS

	B.t.u. / lb. feed
Dehydrogenation:	
$C_2H_6 \rightarrow C_2H_4 + H_2$	1,920
$C_3H_8 \rightarrow C_3H_6 + H_2$	1,309
$nC_4H_{10} \rightarrow C_4H_8 + H_2$	993
Decomposition:	
$C_2H_6 \rightarrow C_2H_4 + CH_4$	659
$nC_4H_{10} \rightarrow C_3H_6 + CH_4$	546
$nC_4H_{10} \rightarrow C_2H_4 + C_2H_6$	528

With higher-boiling materials, such as the decomposition of gas oil into only gasoline or gas, the same magnitude of endothermic reactions is encountered (700 to 1,100 B.t.u. per pound of feed). High values are obtained when much gas is produced or if there is a large difference between the molecular weight of the feed and that of the products.

The opposite occurs in the polymerization or condensation types of reactions. Heat is liberated during the reaction and these are called exothermic reactions. Among the low-molecular-weight olefins, the heat of polymerization appears to be quite constant at about 40,000 B.t.u. for each union of two molecules. This leads to heat liberations such as those shown in Table 2.

TABLE 2—EXOTHERMIC POLYMERIZATION REACTIONS

	B.t.u. / lb. feed
$2C_3H_6 \rightarrow C_6H_{12}$	475
$3C_3H_6 \rightarrow C_9H_{18}$	635
$4C_3H_6 \rightarrow C_{12}H_{24}$	1,070
$C_4H_8 + C_3H_6 \rightarrow C_7H_{14}$	817
$2C_4H_8 \rightarrow C_8H_{16}$	715

The polymerization of higher-boiling materials such as the formation of fuel oil or recycle stock from cracked gasoline appears to require even larger amounts of heat such as even 1,700 B.t.u. per lb.

Commercial operations usually fall between the two extremes, about 900 for decomposition reactions and about 1,100 for polymerization reactions. Thus, a cracking reaction that involves no heat of reaction, would consist of about equal amounts of decomposition and polymerization reactions. This general relationship is illustrated in Table 3, but many exceptions are possible.

TABLE 3—POLYMERIZATION DURING CRACKING REACTIONS

Type of operation—	Per cent‡	Heat of reaction§
Pure polymerization	100	*1,100
Poly. 50-60 per cent olefin feed	83	*760
Cr. and poly. 30 per cent olefin feed	50	*100
Cr. and poly. 20 per cent olefin feed	40	†90
Vapor-phase cracking—gas-oil feed	35	†195
Mixed-phase cracking	22-40	†150-450
Gas cracking — saturated feed	5-10	†730-820
Pure decomposition	0	†900

*Exothermic. †Endothermic. ‡Approximate per cent of polymerization occurring. §B.t.u. per pound feed.

The degree of decomposition or polymerization may also be judged by the temperature rise or fall of the reaction, but this is an awkward method because the amount of diluent that is recycled (or the conversion per pass) must be taken into account.

Characterization Factor and Chemical Composition

What is the relationship between chemical composition and the so-called U.O.P. factor? F.P.S.

The relationship between characterization factor or the U.O.P. factor (specific gravity at 60° F., divided into the cube root of the absolute °R., atmospheric boiling point) and chemical composition cannot be precise. Such a relationship could only indicate the average chemical composition and the average composition means very little. The average chemical composition (or average specific gravity) can even be misleading because it may represent only one series of hydrocarbons or may represent various and numerous mixtures of several series of hydrocarbons. For this reason it is suggested that the characterization factor means little unless it is applied to mixtures that are well known, such as to crude oils or fractions of them or to well-known refinery products such as those of cracking.

An examination of Table 1 shows that a series of hydrocarbons covers a range of characterization factor. Also shown are example hydrocarbons of extremely high or extremely low specific gravity, but it is not claimed that the example hydrocarbons indicate the maximum range of characterization factor. It is quite obvious from Table 1 that the relationship between chemical series and characterization factor is not at all precise. It is also obvious that various mixtures of series of hydrocarbons can result in the same characterization factor. Although the original reference on characterization factor (Ind. Eng. Chem., p. 1460 of 1935) was based on the properties of hydrocarbons, it was not claimed that it was precise when applied to hydrocarbons.

TABLE 1—CHARACTERIZATION FACTORS OF HYDROCARBONS

No. of hydrocarbons	Boiling range, (°F.)	Boiling point, (°F.)	Density range	Density	Characterization factor	Notes
Aromatic Hydrocarbons						
44	176-300	238	.855-.938	.885	10.02	Average
1		223	.....	.938	9.4	1-Phenyl pentadiene
1		246	.....	.855	10.41	4-Phenyl octane
85	300-400	350	.838-.932	.878	10.62	Average
1		331		.932	9.92	3-Phenyl propyne-1
1		385		.836	11.28	1,2,4,5 Tetramethyl benzene
73	400-550	470	.848-.938	.875	11.16	Average
1		477		.938	10.43	2-Phenyl heptadiene 1,3
1		482		.848	11.57	1,5-dimethyl, 2-hexadecyl benzene
Naphthene Hydrocarbons						
152	90-300	200	.681-.872	.788	11.04	Average
1		248		.872	10.23	2,5 dimethyl, 5-cyclohexyl heptane
1		90.5		.681	12.02	1,2 dimethyl cyclopropane
123	300-400	350	.773-.880	.815	11.43	Average
1		324		.880	10.49	Isobutyl diisoamyl cyclohexane
1		312		.773	11.87	1,2 dimethyl, 3,4 diethyl cyclobutane
27	400-445	420	.790-.878	.798	12.0	Average
1		440		.878	10.99	2,4 dimethyl, 3-cyclohexyl pentene-2
1		401		.790	12.03	Hexyl cyclopentane

CORROSION and its control

High-Temperature Hydrogen Attack on Steel

AS previously described, atomic hydrogen is able to penetrate into steel even at low temperatures and pressures. Molecular hydrogen, on the other hand, can diffuse into steel only at high temperatures or pressures. The damage done by the diffusion of atomic hydrogen is a result of the combination of the atoms into molecules, and the resulting buildup of high internal pressures because of the inability of the molecules to diffuse out. When molecular hydrogen diffuses in, however, no high internal pressure is built up, unless conditions are encountered which make further reaction possible.

These conditions are found in ordinary low-carbon steels. The iron carbides present react with the hydrogen, forming methane. The methane molecule is too large to diffuse, and is thus trapped, with the building up of extremely high localized pressures. The reaction takes place along the grain boundaries, and it is along these same boundaries that failure occurs. Microscopic cracks are formed, much too small to be detected visually. It may well be imagined that such a crack would only have to extend for a minute distance in order to relieve the stresses set up by the entrapped methane.

If the affected vessel does not fail, the effect of this hydrogen attack can be detected by the pronounced changes it brings about in the physical properties of the steel. Tensile strength is seriously reduced, often by as much as 60 per cent, with a similar, or slightly greater, reduction in the yield point. Even more seriously affected is the ductility. Steels showing an original elongation of 30 per cent in a 2-in. test length may have the elongation reduced to zero.

The diffused hydrogen will also decarburize the steel to some extent, often at somewhat lower temperatures and pressures; this results in some loss of tensile strength and yield point, but does not produce the cracking which so disastrously weakens the metal.

Unless it is possible to modify the process in such a way as to reduce the hydrogen concentration, or to lower either the operating temperature or pressure, there is no effective method of combating this attack except by the substitution of more resistant materials for the low-carbon steel. Steels with a carbide-stabilizing element added are resistant; among the elements which confer some degree of immunity are manganese, molybdenum, chromium, tungsten, vanadium, titanium, and cobalt. The austenitic stainless steels, for example, are immune because of the chromium content.

The behavior of a specific steel with respect to this type of attack is a function of the temperature and of the pressure. Much of the earlier investigation is of only partial usefulness, because the recorded data was in terms of the total pressure; it is the partial pressure of the hydrogen present which is significant; this, in turn, is determined by the total pressure and by the relative quantity of hydrogen present.

Nelson[1] gives a set of curves covering a temperature range from 400° to 1,400° F., and hydrogen partial pressure from zero to 12,000 psi. Each curve divides this pressure-temperature manifold into two regions, classified as satisfactory or unsatisfactory, for one of the following steels:

(1) Low carbon	(4) 2.0 Cr, 0.5 Mo
(2) 0.5 Cr, 0.5 Mo	(5) 3.0 Cr, 0.5 Mo
(3) 1.0 Cr, 0.5 Mo	(6) 6.0 Cr, 0.5 Mo

In addition, regions are indicated in which decarburization has been found to take place, with less serious consequences.

The hydrogen partial pressure to be used in the selection or evaluation must obviously be that which exists at the region where it is the greatest, with respect to the temperature involved; if the hydrogen concentration varies, this may be quite different from the location of the maximum total pressure.

Process modification, to lower the effective hydrogen partial pressure, has been mentioned as a possible solution; the substitution of alloy steels should be the next possibility to be investigated. It is clear that nonmetallic coatings are not applicable under the conditions described. One remaining possibility is the use of clad metal, with the surface exposed to the process fluids being of the resistant alloy. No data are at hand on a successful application of clad metal to these conditions, and it appears that a careful investigation should be made before any such construction is adopted.

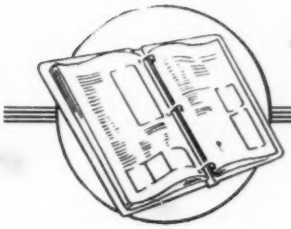
There is no evidence that the alloys listed as resistant are not subject to hydrogen diffusion, but only that the hydrogen is unable to react with the stabilized carbides. Thus the very real possibility exists that the hydrogen could actually diffuse through the cladding, doing no particular damage in passage, and enter the base metal in sufficient quantity to react with the iron carbide present there. This would lead to damage fully as serious as if low-carbon steel alone were employed, with the additional hazard that its discovery might be considerably more difficult.

It will be noted that the circumstances which favor this attack have several factors in common with those which lead to stress-corrosion cracking, and a few in common with the characteristically low-temperature attack by electrolytically produced atomic hydrogen. Thus the three effects are subject to some confusion, or, more important, are likely in some cases to be additive in their results. Fortunately, similar methods of prevention are applicable to all three of them to some extent.

References

G. A. Nelson, "Metals for High-Pressure Hydrogenation Plants," Trans. A.S.M.E., 73:2:205, February 1951.

Part 42 of a series by Marshall E. Parker, consulting engineer, Houston.



THE REFINER'S notebook

No. 105

Summary on Turbine Governors

by J. A. Pellettere*

TYPES of flyball governors were shown in Fig. 1 of No. 103 of the Refiner's Notebook. Other types of turbine governors were shown in Fig. 1 of Installment No. 104.

Present confusion.—The manufacturer at the present time has a close-coupled, well-designed, hydraulic system as evidenced by 4 per cent regulation guarantees. He who would design an all-pneumatic governor and retire this hydraulic equipment is going to find it difficult to obtain 4 per cent regulation with a pneumatic transmission tube with the controls mounted at the receiving end. The control engineer should require that the governor vary the prime-mover speed in accordance with demands from the primary instrument.

Industrial operators of turbines, driving compressors or pumps to control flow in general, are not interested in speed control as such but will eventually insist that the governing mechanism retain its characteristics when operated by the hand speed changer or the pneumatic impulse. Types 2 and 3 (Fig. 1 of Installment No. 103), are wide-range hydraulic governors which could easily meet these requirements but unfortunately the manufacturers have not connected the air impulse into the circuit in the desirable position. Other manufacturers have not seen fit to design into their flyball mechanisms a high range of turndown.

These oddities are the results of the fact that in the past the turbine manufacturer has treated pneumatic control as a passing episode and gone about applying the pneumatic inter-tie to his 50 years of hydraulic experience, in the cheapest and easiest manner. The final outcome often results in retiring the 50 years of hydraulic design to a so-called preemergency status when operating on pneumatic impulse.

*Gulf Oil Corp. Portion of paper presented at 1951 I.S.A. meeting, Houston.

In any critical control problem the control engineer should require not merely to position the steam valve, but to set the speed by air pressure. This means he desires to have the hand speed changer and the air motor work in a similar manner to achieve the end results, whether on hand or pneumatic control. It is obvious that for a high degree of regulation, the flyball must become a part of such a circuit and operate continuously.

Ideal governor.—A true hydraulic governor with no linkage, with the air motor moving the hand speed mechanism as shown by Type 3 of Fig. 1, Installment No. 104, is an idealist's conception of a simple, purely hydraulic, nonmechanical governor. One has to admit, however, that there must be linkage in a large multiple port steam valve positioning mechanism. Therefore, one concedes that Fig. 1, Type 4 (Installment No. 103) or Fig. 1, Type 2 (Installment No. 104), using a variable 4 to 1 flyball operated either by air impulse or by hand speed changer is also of considerable interest, especially when the importance of the job involved will bear the added cost.

Advantages.—For either of these two governors which pneumatically set the speed of a constant speed governor, advantages are:

1. When one operates the hand speed changer mechanism with an air motor, the complete governor is used in its entirety and nothing is retired to a preemergency status.
2. It is easy to build into such a governor a linear response of speed to air-pressure change.
3. The steam valve will not have to be shop characterized to meet the load, which is usually a pump built by another manufacturer.
4. A "second-grade" servomotor which is not a full oil relay type but which operates well in the circuit for which it was intended (in connection with its flyball) will not malfunction when put on air control due to retirement of the primary element (flyball).
5. Any changes in throttle steam pressure, turbine exhaust steam pressure, or steam quality are immediately corrected for, and without the aid of the primary (pneumatic) controller.
6. Flyballs incorporated in such governors are capable of close regulation (2 to 4 per cent) which obviates the need for derivative and reset functions in the governor itself.

The author's solution to the problem of the good governor design, as developed in this paper, is based on the theory of cascaded controls. Too often the control engineer begs to have the primary instrument set a flow controller instead of operating a control valve directly and is told that the secondary instrument (flow meter) is prohibited by the extra costs. All the instrument engineer can do in such an instance is write up a report on the advantages of such a cascaded system in an effort to justify adding the secondary instrument to aid the control valve.

Cascaded controls.—In the governor problem there exists a secondary instrument, the hydraulic speed control circuit, and it should cost little to take advantage of the proper tiein of the primary instrument output. Here the instrument engineer is not having to initiate the cost of the secondary instrument.

The advantages listed for an "ideal" governor are those one gains by cascading or pneumatic setting the speed governor. The speed control (flyball) is an existing instrument which the author feels should not be retired to preemergency work but kept in continuous service so that these real advantages listed previously are made available in the ideal governor as a result of cascading the primary instrument with speed controller.

The author has, since 1943, studied installations of many types of various horsepower units built by four or five American manufacturers. While some difficulty has been experienced on occasions, it has not been necessary to rebuild, redesign, or even replace a major part of a hydraulic unit to get satisfactory operation both for manual and/or pneumatic operation.

Pipe-Line Construction

FOLLOWING is a tabulation of pipeline projects which are planned or under construction. Included are crude-oil, products, and natural-gas lines. This list is compiled from surveys made by The Oil and Gas Journal.

Crude-Oil Pipe Lines

Atlantic Pipe Line Co.—30 miles, 6-in., authorized, Brillhart Station to Ward County, Texas. Completion date 1-1-52.

Continental Pipe Line Co.—105 miles, 8-in., authorized, Rincon to northwest of Sullivan City on to Port Isabel, Tex. Completion date 1952.

Continental Pipe Line Co.—217 miles, 12-in., authorized, Wichita Falls, Tex., to Ponca City, Okla. Completion date 1952.

Derby Oil Co.—15 miles, 6-in., authorized Wichita to Bentley, Kans. Completion date 12-51.

Ohio Oil Co.—117 miles, 22-in., under way, Sheridan, Ind., to Lima, Ohio. R. A. Conyes, contractor.

Pan American Pipe Line Co.—27 miles, 26-in., Genoa to Texas City, Tex. Completion date 12-52.

Pan American Pipe Line Co.—40 miles, 14-in., Arden Station in Irion County to Eldorado Station in Schleicher County. 6-52.

Platte Pipe Line Co.—1,075 miles, 16-20-in., under way, Worland, Wyo., to Wood River, Ill. Completion date 1952.

Platte Pipe Line Co.—573 miles, 16-20-in., under way. Winchester, Wyo., to Brule, Neb. R. H. Fulton & Co. (Sections 1, 2, 3, and 4.—Section 1, 126 miles of 16-in., remainder 20-in.) A. A. Carrigan, spreadman at Casper, Wyo., field office.

Platte Pipe Line Co.—142 miles, 20-in., contracted, near Marysville, Kans., to Holdredge, Neb. Bishop & Lock (Section 5); H. LaQuey, spreadman.

Platte Pipe Line Co.—100 miles, 20-in., contracted, northern edge of Kansas. Rumsey Bros., contractor of Section 6.

Platte Pipe Line Co.—(Section 7). 274 miles, 20-in., Missouri River to Salisbury, Mo., and (Section 8) Salisbury to Mississippi River, under way, field office, Mexico, Mo.; B. C. Hall, spreadman; river crossing field office, Hartford, Ill., Dick Jernigan, spreadman.

Progress Pacific Pipe Line Co.—900 miles, 30-in., proposed, Permian basin. West Texas, to California.

Rancho Pipe Line System.—464 miles, 24-in., authorized, McCamey to Houston, Tex. Completion date late 1952. (Joint project with Sinclair Pipe Line Co., Pan American Pipe Line Co., Tidewater Pipe Line Co., Nantucket Pipe Line Co., and Phillips Pipe Line Co., with Shell Pipe Line Corp. handling construction and operation.)

Roosevelt Oil & Refining Corp.—22 miles, 4 and 6-in., authorized, St. Helens to Norwich, Mich.

Service Pipe Line Co.—19 miles, 16-in., under way, Raytown to Sugar Creek refinery, Mo. Sheehan Pipe Line Const. Co., contractor. J. W. Brown, spreadman at Raytown, Mo.

Service Pipe Line Co.—29 miles, 20-in., authorized; Drumright, Okla., to Humboldt, Kans.; 30 miles, 20-in., under way. Freeman to La Plata, Mo., G. G. Griffis Const. Co. Completion date 12-51. 24 miles, 10-in., contracted, Denton, N. M., to Wasson, Tex., Crossley and Hardy, contractor.

Shell Pipe Line Corp.—66 miles, 8-in., authorized, Gohlke to La Grange, Tex. Company crews. Completion date 1952.

Sinclair Pipe Line Co.—674 miles, 22-24-in., authorized; Drumright, Okla., to E. Chicago, Ind. Completion date 1952.

Sinclair Pipe Line Co.—150 miles, 24-in., contracted, Drumright-Cushing, Okla., area, to Humboldt, Kans. O. R. Burden Construction.

Skelly Oil Co.—38 miles, 8-in., under way, Lyons to Burrton, Kans. Rumsey Bros., contractor. Completion date 1-52.

Texas Pipe Line Co.—319 miles, 22, 12, 10-in., Louisiana Gulf Coast to Port Arthur, Tex., including 220 miles, 22-in., Houma, La., to Port Arthur, Tex.; 31 miles, 12¾-in., Houma to Cocodrie, La. Houston Contracting Corp. Completion date in summer 1952.

West Texas Gulf Pipe Line Co.—467 miles, 26-in., authorized, Colorado City to Wortham, Tex., 26-in.; Wortham to Sour Lake, Tex., 24-in. Completion date 10-52.

West Texas Gulf Pipe Line Co.—114 miles, 20-in., authorized, Wortham to Longview, Tex. Completion date 10-52.

Products Pipe Lines

Bell Oil & Gas Co.—150 miles, 6-in., planned, Ardmore to Drumright, Okla. (Includes 114 miles, 8-in.; 32 miles, 6-in.)

Buckeye Pipe Line Co.—370 miles, 8, 12, 16-in., authorized, Linden, N. J., via Allentown, Pa., to Auburn, Syracuse, Waterloo, and Rochester, N. Y. (Sections divided as follows: 75 miles, 16-in., 218 miles, 12-in., 77 miles, 8-in.) Start 1952, completion of 16-in., 1952, balance 1953.

Ohio Oil Co.—24 miles, 8-in., authorized, East St. Louis to Wood River, Ill.

Phillips Oil Co.—28 miles, 12-in., authorized, Sweeny to Freeport, Tex.

Phillips Pipe Line Co.—68 miles, 12¾-in., under way, Osawatomie westward to Wichita, Kans. Brown Lite Co. R. E. Carriker, spreadman at Osawatomie, Kans.

Phillips Pipe Line Co.—40 miles, 10-in., through Monteau, Cole, Osage, and Gasconade counties, Missouri. Trojan Const. Co. E. L. Maggard, spreadman at Linn, Mo.

Phillips Pipe Line Co.—48 miles, 12-in., under way, looping from Wichita, Kans., to Buffalo, Okla. G. G. Griffis Const. Co. Joe Bishop, spreadman, at Medicine Lodge, Kans. 12-51 completion date.

Phillips Pipe Line Co.—74 miles, 8-in., under way, looping from Decatur, Ill., to East Chicago, Ind. Somerville Const. Co., contractor. 12-51 completion date.

Phillips Pipe Line Co.—69 miles, 12-in., authorized, looping from Paola to Wichita, Kans.

Phillips Pipe Line Co.—137 miles, 10-in., authorized, looping from Paola, Kans., to East St. Louis, Ill. Completion date 11-51.

Progress Pacific Pipe Line Co.—900 miles, 10-in., proposed, California to West Texas.

Salt Lake Pipe Line Co.—Proposed, Pasco, Wash., to Puget Sound.

Shell Oil Co.—565 miles, 8-14-in., planned, Wood River via East Chicago to Detroit; 35 miles, 14-in. Completion date summer of 1952.

Sinclair Pipe Line Co.—8-in., proposed, Sinclair, Wyo., to Salt Lake City, Utah; 10-in., Houston to Baton Rouge; 16-in., Kalamazoo to Detroit; 20-in. Marcus Hook to Bayonne, N. J.; East Chicago to South Bend, Ind.

Socony-Vacuum Oil Co., Inc.—175 miles, 6-8-in., under way, Augusta, Kans., to Kansas City, Mo. Ray L. Smith & Son, Inc. (Spreadmen are located as follows: Dewey Whitworth at Topeka, Kans.; Carl Samuel Colvin at Burlingame, Kans.; George Kelpar at Topeka, Kans.; Clark Liggett, Tonganoxie, Kans.) Completion date 1-1-52.

Standard Oil Co. (Ind.).—122 miles, 8-in., under way, Neodesha, Kans., to Belton, Mo. Bills & Troth Construction Co., Carl Bills, superintendent, at Armory Building, Neodesha. Completion date 1952.

Standard Oil Co. (Ohio).—17 miles, 6-in., authorized, Toledo to West Toledo, Ohio.

United States Pipe Line Co.—1,000 miles, proposed, Gulf Coast via Memphis, Nashville, Tenn., Lexington, and Paducah, Ky., to Cincinnati, Ohio.

Natural-Gas Pipe Lines

Allied Gas Co.—24 miles, 6⅝-in., proposed, McLean to Champaign County, Illinois.

Amere Gas Utilities Co.—16 miles, 8⅝-in., proposed, loops from Mercer County to Princeton, W. Va.

Amere Gas Utilities Co.—15 miles, 8⅝-in., proposed, near Dameron to Flat Top, W. Va.

Associated Natural Gas Co.—68 miles, authorized, Missouri.

Carolina Natural Gas Corp.—185 miles, 2-12-in., proposed, lateral lines off Transcontinental in North and South Carolina.

Cities Service Gas Co.—179 miles, 4-30-in., gathering system in vicinity of Ulysses, Kans. Vaughn & Taylor Const. Co., Inc. D. D. Vaughn, spreadman, Ulysses.

Coast Counties Gas & Electric Co.—40 miles, 3, 4, and 8-in., planned. Coast and Valley region, California.

Colorado Interstate Gas Co.—250 miles, 20-in., under way, Kit Carson, Colo., to Amarillo, Tex. R. H. Fulton & Co., contractor. Jerry Nash, spreadman at Lamar, Colo.

Commonwealth Natural Gas Corp.—537 miles, 20-in., proposed, West Bend, Ky., to Norfolk, Va.

Cumberland and Allegheny Gas Co.—46 miles, 10-in., authorized, Mountain Lake Park, Md., to Preston County, W. Va.

Dow Chemical Co.—70 miles, various sizes, Midland, Saginaw, and Bay City, Mich.; Mahoney Contracting Co., contractor, Ralph Bucher, spreadman at Midland.

East Tennessee Natural Gas Co.—172 miles, 22-in., authorized, Greenbrier to Oak Ridge, Tenn.

East Tennessee Natural Gas Co.—100 miles, 16-in., proposed, Knoxville to Kingsport, Tenn.

El Paso Natural Gas Co.—122.9 miles, 30-in., proposed, looping along main line in Texas, New Mexico, Arizona.

Equitable Gas Co.—17 miles, 16-in., under way, near Pittsburgh. H. L. Gentry Const. Co., contractor. Lavern Curtis, spreadman at Sewickley, Pa.

Georgia Gas Co.—32 miles, 4½-in., proposed, Bogart to Gainesville, Ga.

Glacier Gas Co.—285 miles, 20-in., proposed, Kalispell, Mont., to Spokane, Wash.

Glacier Gas Co.—120 miles, 16-in., proposed, Spokane to Hanford, Wash.

Glacier Gas Co.—91 miles, 8⅝-in., proposed, Spokane to Lewiston, Idaho.

Glacier Gas Co.—130 miles, 12¾-in., proposed, Spokane to International boundary at Trail, British Columbia.

Grand Valley Pipe Line Co.—105 miles, 8-10-in., planned, Piceance Creek field to Rifle on to Grand Junction, Colo.

Gulf Michigan Transmission Corp.—680 miles, 30-in., proposed, Perryville, La., across Arkansas, Missouri, and Illinois to terminus near St. John, Ind.

Home Gas Co.—17 miles, 12-in., proposed, loops from Hancock to Sanford, N. Y.

Houston Pipe Line Co.—24 miles, 18-in., under way, Houston to Bammel gas field, Harris County, Texas.

Iowa-Illinois Gas & Electric Co.—41 miles, 10-in., authorized, Washington County to Cedar Rapids, Iowa.

Kansas-Nebraska Natural Gas Co.—40 miles, 6-in., under way. Albion to Norfolk, Neb. Jayhawk Const. Co., Inc., contractor; F. A. Faler, spreadman at Albion.

Kansas-Nebraska Natural Gas Co.—30 miles, 6-in., under way, Albion to Neligh, Neb. Jayhawk Const. Co., Inc., F. A. Faler, spreadman at Albion.

Kansas-Nebraska Natural Gas Co., Inc.—60 miles, 8-10-12-in., under way, Grand Island to Albion, Neb.

Kansas-Nebraska Natural Gas Co.—65 miles, 2-8-in., authorized, Big Springs field to Ogallala, Neb., and to Ovid, Colo.

Kansas-Nebraska Natural Gas Co., Inc.—39 miles, 4 and 6-in., planned, Neligh to O'Neill, Neb., 54 miles, 4 and 6-in. planned, Neligh to Hartington, Neb. (extension) Completion date 1952.

Kansas Power & Light Co.—27 miles, 20-in., authorized, Pratt, Kans., to Calista compressor station.

Lake Shore Pipe Line Co.—45 miles, 10¾-in., authorized, northwesterly from T.G.T. system near Meadville, Pa., to Ashtabula, Ohio.

Michigan Gas Storage Co.—93 miles, 16-22-24-in., under way, Laingsburg to near Pontiac and Mount Clemens, Mich. (Includes 17 miles of lateral lines.) Mahoney Contractor. Completion date 6-52.

Michigan Gas Storage Co.—30 miles, 26-in., authorized, looping between Laingsburg and Mount Pleasant Junction, Mich.

Michigan Gas Utilities Co.—77 miles, under way, Sturgis, Hillsdale, and Coldwater, Mich. (22.7 miles, Marshall south to Coldwater; 20 miles, Coldwater easterly to Hillsdale; 22.5 miles, Hillsdale to Sturgis; 11 miles, Hillsdale to Jonesville.) Somerville Const., contractor. Jim Godwin at Coldwater.

MidSouth Gas Co.—240 miles, proposed, Greene, Poinsett, Crittenden, St. Francis, Lee, Phillips, Monroe, Woodruff, and Cross counties, Arkansas.

Mississippi River Fuel Corp.—98 miles, 16- and 18-in., authorized, feeder line from Lincoln Parish, Louisiana, to Waskom field, Harrison County, Texas.

Mississippi River Fuel Corp.—40 miles, 18-in., authorized, Dubach to Perryville, La.

Montana Power Co.—52 miles, 16-in., authorized, Canada-Montana border to Cut Bank, Mont.

National Utilities Co. of Michigan.—76.7 miles, 20-in., proposed, South Central Michigan. (22 miles from near Marshall south to Coldwater; 20 miles east to Hillsdale; 22 miles southwest to Sturgis; 5 miles from Hillsdale to Jonesville and 6 miles west to Union City.)

New River Gas Co.—50 miles, planned, Summers or Monroe counties, West Virginia to Narrows and Dublin, W. Va.

New York State Natural Gas Corp.—66 miles, 20-in., proposed, looping on Westmoreland, Armstrong, and Tioga counties, Pennsylvania. (Includes 17 miles, 16-in. in Potter County, Pennsylvania, and 21 miles 14 in., replacement in Line No. 507, New York.)

Niagara Mohawk Power Corp.—40 miles, 10-12-16-in., under way, lateral lines at Utica, N. Y.; 55 miles, 10-in., Fulton to Watertown, N. Y.; Williams-Austin Co., contractor, Howard Bauer, supt.

Northeastern Gas Transmission Co.—511 miles, 20-24-in., authorized, New Hampshire, Massachusetts, and Connecticut.

Northeastern Gas Co.—411 miles, proposed, New England towns.

Northern Natural Gas Co.—580 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska loops.

Northern Natural Gas Co.—370 miles, 4-26-in., authorized, gathering lines in Hugoton field.

Northern Natural Gas Co.—217 miles, 26-in., under way, Palmyra, Neb., to Skellyville, Tex. G. G. Griffis Const. Co., contractor; field office, Beatrice, Neb.; G. L. Mims, superintendent; E. G. Grisham, spreadman.

Northern Natural Gas Co.—210 miles, 26-in., proposed, five loops in Texas-Oklahoma area, two in Kansas, and two in Nebraska.

Northern Natural Gas Co.—181 miles, 4-12-in., contracted, gathering system in Hugoton area. Reese Bros. Const., contractor. Completion date in spring.

Northern Natural Gas Co.—108 miles, 26-in., under way, Beatrice, Neb., to Mullenville, Kans. G. G. Griffis Const. Co. E. G. Grisham, spreadman at Great Bend, Kans. Completion date 12-1-51.

Northern Indiana Fuel & Light Co.—33 in., authorized, Perryville Station, La., to Boeuf River.

Northwest Natural Gas Co.—750 miles, planned, Washington, Oregon, and Idaho.

Ohio Fuel Gas Co.—25 miles, 20-in., under way, Xenia, Ohio. Sheehan Pipe Line Const. Co. Earl Williams, spreadman at Xenia.

Ohio Fuel Gas Co.—22 miles, 16-in., authorized, Dayton, Troy, Piqua, and Sidney, Ohio.

Ohio Fuel Gas Co.—23 miles, 16-20-in., authorized, Wellington to Elyria, Ohio; 16 miles, 20-in. authorized, Benton Station to Crawford Station, completion date 11-15-51. 18 miles, 20-in., Crawford Station to near Columbus, completion date 12-31-51. 16 miles, 16-in., authorized, Berlin Heights to Sandusky, Ohio, completion date 12-31-51.

Ohio Fuel Gas Co.—74 miles, 3 to 20-in.,

authorized, Hocking, Knox, and Ashland counties, Ohio.

Ohio Fuel Gas Co.—47 miles, 20-in., authorized, Benton Township, Hocking County, to Columbus, Ohio.

Ohio Fuel Gas Co.—61 miles, authorized northern and southwestern Ohio.

Oklahoma Natural Gas Co.—14 miles, 8⅝-in., under way, Shamrock to Cushing, Okla.; 21 miles, 24-in., under way, Depew to Kellyville, Okla. Completion date 1-15-52. 9 miles, 12¾-in., Stroud to Depew, Okla. 26 miles, 12-in., under way, Ringwood to Enid, Okla. Completion date 3-15-52.

Pacific Gas & Electric Co.—44 miles, 8-in., under way, Salinas to King City, Calif.

Pacific Gas & Electric Co.—141 miles, 34-in., proposed, parallel sections along Topock-Milpitas line.

Pacific Gas & Electric Co.—10 miles, 10-12-in., authorized, Monterey to Fort Ord to Castroville; 12 miles, 16-in., Napa Wye to Shellville; 6 miles, 12-in., Cotati to Santa Rosa, Calif.

Pacific Northwest Pipe Line Co.—400 miles, 22-in., gathering lines on Texas Gulf Coast to Pacific Northwest pipe line.

Pacific Northwest Gas Pipe Line Corp.—1,175 miles, planned, Wharton County, Texas, via Oklahoma, Kansas, Fort Collins, Colo., to Portland, Ore., Tacoma and Seattle, Wash.

Panhandle Eastern Pipe Line Co.—70 miles, 24-26-in., under way, looping from Sneed, Tex., to Emporia, Kans.

Panhandle Eastern Pipe Line Co.—174 miles, 30 and 26-in., contracted, Tuscola, Ill., eastward—looping present system; R. A. Conyes, contractor. 44 miles, 26-in., Edgerton, Mich.; Anderson Bros.; 22 miles, 30-in., looping in Tuscola, Ill.,; 45 miles, 30-in., looping in Montezuma, Ind.; 63 miles, 30-in., looping in Zionsville, Ind.

Pennsylvania Gas Co.—52 miles, 12-in., between Warren and Erie, Pa. (Section 1—27 miles, under way and contracted by Harford Bros. Section 2—25 miles.

Peoples Natural Gas Co.—25 miles, proposed, Cambria and Blair counties, Pennsylvania.

Phillips Petroleum Co.—118 miles, 3-22-in., under way, Sherman and Hansford counties, Texas, gas-gathering system; Vaughn & Taylor Construction Co., Inc., Dumas, Tex., J. F. Crawford, spreadman at Texhoma, Okla.

Piedmont Natural Gas Co.—28 miles, 6-in., proposed, North Carolina, laterals from Transcontinental gas system.

Prince George's Gas Corp.—20 miles, 22-in., authorized, between Chillum and Rockville, Md.

Public Service Co. of North Carolina.—33 miles, 10-in., authorized, Burlington to Chapel Hill, N. C., completion date 3-1-53; 16 miles, 8-in., authorized, Chapel Hill to Raleigh, N. C., completion date 7-1-52; 29 miles, 4-in., authorized, Statesville to Kanapolis, N. C., completion date 7-1-52; 83 miles, 8-in., authorized, Kings Mountain to Asheville, N. C., completion date 3-1-53.

Rockland Light & Power Co.—22 miles, 8-in., proposed, Orangetown to Tompkins Cove, N. Y.

Southern California Gas Co.—35 miles, planned, Antelope Valley, California.

Southern California Gas Co. and Southern Counties Gas Co. of Calif.—45 miles, 30-in., proposed, looping on line from Arizona border to Los Angeles.

Southern California Gas Co. and Southern Counties Gas Co.—36 miles, 6-8-in., contracted, Palmdale to Mojave, Calif., Alex Robertson Co., contractor, E. C. Neal, spreadman at Lancaster, Calif., completion date 11-1-51.

Southern California Gas Co. and Southern Counties Gas Co. of California.—81 miles, 30-in., proposed, Whitewater to Desert Center, Calif.

Southern Natural Gas Co.—21 miles, 24-miles, 8-in., proposed, Edgerton to Auburn, Ind.

Southern Natural Gas Co.—14 miles, 24-in., authorized, Onward Station, Miss., to Big Sunflower River.

Southern Natural Gas Co.—14 miles, 14-in., authorized, Perryville Station, La., to Wilhite Gate.

Southern Natural Gas Co.—375 miles, 24-in., planned, Gwinville, Miss., to Atlanta, Ga.

Southern Natural Gas Co.—169 miles, proposed loops, Ouachita Parish, Louisiana, to Augusta, Ga.; 20 miles in Ouachita Parish, 33 miles in Ouachita and West Carroll parishes; 7 miles, Sharkey County, Mississippi; and 108 miles, 14-in., Bass Junction to Augusta, Ga.

Southwest Gas Corp., Ltd.—26 miles, proposed, from P.G.&E. line to Victorville, Calif.

Sunray Oil Corp.—133 miles, 3-30-in., under way, system for Snyder gasoline plant. Vaughn & Taylor Construction Co., contractor. D. D. Vaughn, spreadman.

Tennessee Gas Transmission Co.—521 miles, planned, looping along present system; 420 miles, 30-in., Texas, La., Ark., Miss., Tenn., and Ky.; 101 miles, 26-in., in Kentucky and Ohio.

The Texas Co.—27 miles, 8-in., authorized, Ventura to Filmore, Calif.

Texas Eastern Transmission Corp.—791 miles, 30-in., under way, Kosciusko, Miss., to Connellsville, Pa.

(Section 1 and 2) 163 miles, 30-in., under way, Kosciusko, Miss., to Florence, Ala. Williams Bros.-Davis Co.

(Section 3) 76 miles, 30-in., Florence, Ala., to Columbia, Tenn. Eastern Pipe Line Contractors.

(Section 4) 73 miles, 30-in., under way, Columbia, Tenn., to Cumberland River. H. B. Zachry Co. A. Vaughn superintendent at Lebanon, Tenn. Completion date 12-10-51.

(Section 5) 79 miles, 30-in., under way, Cumberland River to Columbia, Ky. Oman Const. Co. William Smith, superintendent and Floyd Hudnell, spreadman at Columbia, Ky.

(Section 6) 82 miles, 30-in., under way, Columbia, Ky., to Boonesboro, Ky. N. A. Saigh Co.

(Section 7) 100 miles, 30-in., under way, Kentucky River to Ohio River, northeastern Kentucky. Mahoney Const. Co.

(Section 8) 77 miles, 30-in., under way, Portsmouth to Amesville, Ohio. Anderson Bros. Corp.

(Section 9) 74 miles, 30-in., under way, Amesville to Ohio-West Virginia river crossing. Anderson Bros. Corp.

(Section 10) 66 miles, 30-in., under way, Ohio River to Connellsville, Pa. Anderson Bros. Corp.

Texas Eastern Transmission Corp.—50 miles, 30-in., under way, Ohio River to Vanceburg, Ky. Trojan Construction Co., Inc., contractor. Charles Tillotson, spreadman at Morehead, Ky.

Texas Gas Transmission Corp.—35 miles, 12-in., authorized, Slaughters, Ky., to Evansville, Ind.

Texas Gas Transmission Corp.—189 miles, 26-in., authorized, Acadia Parish to connection with existing facilities in Morehouse Parish.

Texas Gas Transmission Corp.—195 miles, 26-in., proposed, Gulf Coast region to southwestern Louisiana.

Texas Gas Transmission Corp.—425 miles, 26-in., authorized, looping from Bastrop, La., to Hardinsburg, Ky.

Texas Gas Transmission Corp.—181 miles, 26-in., under way, Bastrop to Eunice, La., Houston Contracting Co. (North spread near Beekman, 65 miles south to Grayson, La., W. H. Hayes, supt.; center spread, north side of Red River at Pineville, 60 miles north to Grayson, E. C. Norris, supt.; south spread, south side of Red River, 56 miles south to Tepetate field near Eunice, F. A. Silar, supt.)

Texas Gas Transmission Corp.—580 miles, 26-in., proposed, Louisiana and Kentucky.

Texas-Ohio Gas Co.—1,350 miles, 30-in., authorized, Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va. Completion date 6-30-53.

Union Gas & Electric Co.—33 miles, 8-in., Farmer City to Bloomington, Ill. Contracting & Material Co. A. T. Perry, spreadman at LeRoy, Ill. Completion date 12-15-51.

Union Oil Co. of California.—40 miles, 8-10-in., planned, San Joaquin Valley and Los Angeles Basin.

United Fuel Gas Co.—32 miles, 20-in., under way, Lanham to Broad Run, W. Va. H. L. Gentry Construction Co., contractor. Frank Morris, spreadman at Charleston, W. Va.

United Gas Pipe Line Corp.—315 miles, 24-30-in., contracted, Agua Dulce to near Goodrich, Tex. Oklahoma Contracting Co., contractor. Panama Shiflett, spreadman, El Campo, Tex.; Ray Law, spreadman, Victoria, Tex.

United Gas Pipe Line Co.—93 miles, 20-24-26-in., under way, Houston to Du Pont's Sabine River Works, Orange, Tex. River Const. Co.

United Gas Pipe Line Co.—50 miles, 16-in., authorized, Baldwin County, Alabama southeasterly to Escambia County, Florida.

United Gas Pipe Line Co.—100 miles, 20-24-26-in., contracted, near Houma to Franklin, La.; Associated Pipe Line Contractors, Inc.

United Gas Pipe Line Corp.—510 miles, 24-26-30-in., contracted, Agua Dulce, Tex., to Monroe, La.; 233 miles, 20-24-26-30-in. from Pure Oil Co.'s offshore platform, Block 32 Eugene Island area to Jackson, Miss., comp. sta.; 60 miles, 12-16-20-in., from Lafayette comp. sta. and Weeks Island field to Franklin, La., to connect with above mentioned 30-in.; 59 miles, 30-in., Jackson comp. sta., Miss. to Texas Eastern Trans. Corp.; 124 miles, Sterlington comp. sta. near Monroe, La., to Jackson comp. sta., Miss.; 23 miles, 8-12-16-in., South Louisiana facilities; all contracted by Gulf Southern Contractors, a joint venture including Texas Louisiana Contractors; Oklahoma Contracting Co.; J. Ray McDermott and Morrison Knudson. Inspection by Brown & Root, Inc.

United Gas Pipe Line Co.—65 miles, 30-in., under way, Gonzales, La., to Kosciusko, Miss. River Const. Corp. Red Tatum, spreadman at Hammond, La. Completion date 11-51.

United Gas Pipe Line Co.—43 miles, 24-in., under way, Baxterville, La., to McComb, Miss. River Const. Corp. Jim Reed, spreadman at Columbia, Miss. Completion date 11-1-51.

United Gas Pipe Line Co.—87 miles, 20-in., under way, State Line to Jackson, Miss. River Const. Corp. Merle Tatum, spreadman at McComb, Miss. Completion date 12-15-51.

U.S.E.D.—18 miles, 8⅝-in., contracted, Norwalk to Long Beach, Calif. J. E. Young Pipeline Contractor, Inc.

Utah Natural Gas Co.—360 miles, 22-in., proposed, San Juan Basin area to Salt Lake, Utah.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Western Kentucky Gas Co.—2 to 4-in., under way, additions to present system; Modern Welding Co., Inc., contractor.

Western Pipe Lines.—1,200 miles, 22-in., planned, southern Alberta to Duluth, Minn.

West Texas Gas Co.—27 miles, 10-in., authorized, Lubbock to Abernathy, Tex.

West Texas Gas Co.—32 miles, proposed, Potter and Randal counties, Texas.

Foreign Crude-Oil Pipe Lines—Planned and Under Way

Alberta-Vancouver Oil Pipe Line Co.—(Brokaw, Dixon, McKee).—972 miles, 16-in., proposed. Edmonton via Pincher Creek, Alta., Idaho and Washington states to Vancouver, B. C.

Cia. de Petroleo Ganso Azul, Ltd.—48 miles, 4-in., planned, Ganso Azul field to Pucalpa on upper Ucayali River, Peru.

Condor S.P.A.—82 miles, 12-in., under way, Genoa to Rho, near Milan, Italy.

Direccion General de Yacimientos Petroliferos Fiscales.—409 miles, under way, Plaza Huincul to Bahia Blanca, Argentina.

Independent Pipe Line Co.—721 miles, 16-18-22-in., proposed, Edmonton to Vancouver. Spreads as follows: 185 miles of 22-in.; 391 miles, 20-in.; 95 miles, 16-in.; and 30 miles, 18-in.

Iraq Government.—135 miles, 12-in., proposed, from Iraq Petroleum Co. at Baiji to Baghdad, Iraq. Construction 1952. M. W. Kellogg, contractor.

Iraq Petroleum Co., Ltd.—556 miles, 30-32-in., under way, Kirkuk, Iraq, to Banias, Syria, 1952; Bechtel-Kirkuk, contractor.

Iraq Petroleum Co., Ltd.—72 miles, 12¾-in., Zubair to Fao. Arabian Bechtel Co., contractor. Completion date 12-51.

Middle East Pipelines, Ltd.—800 miles, 34-35-in., planned, Iran to a Levantine port.

Petroleos Mexicanos.—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

Petroleos Mexicanos.—100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

Shell Caribbean Petroleum Co.—160 miles, 30-in., under way; Palmajero to terminals on the Paraguana Peninsula (Cardon and Las Piedras, Venezuela), 4-52. Land sections contracted by Williams Brothers, de Venezuela, S.A., Charles P. Williams, manager, Marvin E. Jones, superintendent. Water crossings contracted by Mahoney Contracting Co.

Texas Petroleum Co.—60 miles, 4-6-in., under way, Pto. Nino to La Dorada.

Trans-Mountain Oil Pipe Line Co.—715 miles, proposed, Edmonton, Alta., to Vancouver, B. C. Canadian Bechtel, Ltd., engineers.

Foreign Products Pipe Lines—Planned and Under Way

Colombia Ministry of Petroleum.—90 miles 6-in., planned, Puerto Berrio to La Dorada, Colombia.

Colombia Ministry of Petroleum.—113 miles, 6-in., contracted, Puerto Berrio to Acededo near Medellin, Colombia. Carolina Construction Co.

Colombian Ministry of Petroleum.—75 miles, 4-in., planned, Buena Ventura to Cali, Colombia.

Empresa de Ferrocarriles Ecuatorianos.—50 miles, 4-in., contracted, Guayaquil to Palmira, Ecuador. J. A. Jones, contractor; C.R.C. Engineering Co., engineers.

Estrada de Ferro Santos a Jundiai.—32 miles, 18-in., under way, Santos to Sao Paulo, Brazil (fuel oil line); Techint, contractor. Completion date 12-51.

Governments of Southern Rhodesia and Portuguese East Africa.—200 miles, considered, Beria, Portuguese Mozambique to Umtali, Southern Rhodesia.

Imperial Oil Co., Ltd.—230 miles, 10-12-in., under way, Sarnia via London, Hamilton to Toronto, Ont., Canada. Comstock Midwestern, Ltd., contractor. Completion date July 1952.

Petrocongo (Sub. Cie. Financiere Belge des Petroles, S.A.).—225 miles, considered, Ango-Ango to Leopoldville, Belgian Congo.

Petroleos Mexicanos.—155 miles, 10-in., under way, Minatitlan to Salina Cruz, Mexico.

Societe des Transports Petroliers par Pipe Line.—140 miles, 10-in., under way, Le Havre to Paris, France. Entrepose, contractor. Completion date 1952.

State of Cundinamarca, Colombia.—120 miles, 6-in., Puerto Salgar to Bogota, Colombia; Williams Brothers Co.; David Louthen, manager, Bogota.

Trans-Northern Pipe Line Co.—400 miles, proposed, Hamilton, Ont., to Toronto, Ont., to Montreal, Que., Canada.

Foreign Natural-Gas Pipe Lines—Planned and Under Way

Azienda Generale Italiana Petroli.—110 miles, 12-14-16-in., planned, Cortemaggiore to Genoa.

Azienda Generale Italiana Petroli.—145 miles, 14-16-in., under way, Cortemaggiore to Torino. Completion date 1951.

Canadian Delhi Oil Co. (Subsidiary Delhi Oil Co.).—2,132 miles, proposed, Alberta, Toronto, Montreal.

Canadian-Montana Pipe Line Co.—68 miles, 4-16-in., under way, Pakowki Lake field to Alberta-Montana border.

Direccion General del Gas del Estado.—310 miles, 8-in., under way, Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.

Northwest Natural Gas Co.—950 miles, 24-in., planned, Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.

Northwestern Utilities, Ltd.—35 miles, 16-in., authorized, Viking to Shonts, Alberta.

Petroleos Mexicanos.—205 miles, 16-in., considered, Monterrey to Torreon, Mexico.

Petroleos Mexicanos.—260 miles, 20-in., under way, Monterrey to Tampico and Poza Rica, Mexico.

Petroleos Mexicanos, Mexican Gas Co., and Industrial Gas Co.—600 miles, planned, Reynosa, Tamaulipas, to Tampico-Poza Rica, Mexico.

Trans-Canada Pipe Lines, Ltd.—Proposed, Alberta to Toronto to Montreal.

Venezuela Atlantic Transmission Corp.—195 miles, 10-12-16-in., under way, El Placer near Las Mercedes, State of Guarico to Caracas, La Guaria, Maracay, and Valencia. Contracted by Williams Brothers, de Venezuela, S.A., B. E. Barnes, manager.

Westcoast Transmission Co., Ltd.—1,110 miles, 24-in., planned, Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton, and Vancouver to Portland. Ford, Bacon & Davis, engineers.

Westcoast Transmission Co., Ltd.—280 miles, 20-in., planned, Pincher Creek to Montana on to Spokane, Wash. Ford, Bacon & Davis, engineers.

Western Pipe Lines.—1,033 miles, 24-in., proposed, from Southern Alberta, eastward across the Canadian Prairies, serving principal towns and cities along the route to a point near the International Boundary.

"Why he CAN'T be with Phillips—he isn't tall enough to have played basketball!"

PIPE LINES

FPC O.K.'s Expansion of Colorado Interstate System

WASHINGTON. — Colorado Interstate Gas Co. has received the green light from the Federal Power Commission to build 49 miles of mainline loop and lateral lines and to install 3,120 hp. at existing compressor stations along its system.

The expansion would raise system capacity from the present 360,000,000 cu. ft. to about 413,000,000 cu. ft. per day.

Under the company's present plan, capacity would be further increased to 438,000,000 cu. ft. per day in 1953. The entire program would cost about $3,453,105.

Additional compressor units will be installed at the company's Panhandle field station increasing horsepower from 4,800 to 6,600, and a 1,320-hp. unit added at its Kit Carson, Colo., station.

Texas Gas Plans Immediate Boost in Carrying Capacity

WASHINGTON.—Texas Gas Transmission Corp. intends to proceed immediately with a 12,240-hp. expansion in compression facilities of its system.

Temporarily authorized by the Federal Power Commission December 27, the $2,992,760 expansion will increase the system's carrying capacity to Ohio and Kentucky by an estimated 12,700,000 cu. ft. daily.

Construction, to be completed this winter, calls for a new compressor station near Madison, Ind., and increases in horsepower of stations at Kenton, Tenn., and Calvert City, Slaughters, and Hardinsburg, Ky. About 75 per cent of the additional gas will go to Ohio Fuel Gas Co., Columbus, and the remainder to Louisville Gas & Electric Co.

This construction is part of a long-range plan under which Texas Gas hopes to build 407 miles of lines to increase deliveries to Ohio, Kentucky, Indiana, Illinois, Arkansas, Tennessee, and Mississippi. The commission as yet has not set a hearing date on this application.

Kansas-Nebraska's Proposal To Boost Capacity Approved

WASHINGTON.—Kansas-Nebraska Natural Gas Co., Inc., is seeking Federal Power Commission approval for a pipe-line-construction program which would expand capacity of its transmission system from the present 182,600,000 cu. ft. to 193,300,000 cu. ft. per day.

The proposed construction includes about 179 miles of lines in Kansas and Nebraska, shifting of compressors, and substitution of 10¾-in. pipe for 8⅝-in. on a 52-mile line in Nebraska already o.k.'d by FPC.

Some of the new line will go to replace 93 miles of existing line which will be removed and salvaged. The proposed program would increase capacity of the Kansas-Nebraska system to meet increased requirements of existing customers.

Texas Gas Subsidiaries Ask Approval of Lines Operation

WASHINGTON. — Texas Northern Gas Corp. and Louisiana Natural Gas Corp., both subsidiary firms of Texas Gas Transmission Corp., have filed with the Federal Power Commission for permission to operate pipe-line facilities to make natural-gas deliveries to Texas Gas in North Tepetate gas field in Louisiana.

Applications were filed to comply with an FPC order issued in November authorizing Texas Gas to build a 189-mile gas line in Louisiana. The commission conditioned the permit with a requirement that the two subsidiaries file for authorization of their facilities before the line could be used for transportation or sale of gas.

Texas Gas is proposing to purchase up to 46,800,000 cu. ft. of gas per day from Texas Northern and up to 93,200,000 cu. ft. per day from Louisiana Natural.

Louisiana Natural's system consists of about 165 miles of lines in Louisiana. Texas Northern owns about 38 miles of lines in Louisiana.

Sinclair Under Way on Big Crude Line to East Chicago

INDEPENDENCE, Kans.—Sinclair Pipe Line Co. has begun construction of its big 675-mile, 24-in. crude trunk between Cushing, Okla., and East Chicago, Ind.

The $53,000,000 line will have a capacity of 300,000 bbl. daily on completion. Equipped with seven electrically operated pump stations, the line will be one of the main crude arteries from producing areas to refining centers at St. Louis and Chicago.

O. R. Burden Construction Co. is reported to have three spreads on the job—two in the Caney, Kans., area and one near Cushing. The 140-mile section of 24-in. under contract to Burden runs from the Drumright-Cushing area to Humboldt, Kans.

Coating, Wrapping Contract Awarded on New Crude Line

HOUSTON. — Houston Contracting Corp. has awarded contract to Clem A. Mayes Co. of Lake Charles, La., for coating and wrapping of Texas Pipe Line Co.'s new crude line to be laid from Port Arthur, Tex., to Cocodrie, La., in Terrebone Parish.

The line will consist of approximately 220 miles of 22-in. pipe from Port Arthur to Houma, La.; 28 miles of 12-in. pipe from Houma to Cocodrie; and 60 miles of 10, 8, 6, and 4-in. gathering system in the Terrebone Bay area.

Clem A. Mayes will set up 10 coating and wrapping yards. These will be located one each at Orange, Tex., Sulfur, Holmwood, Lake Arthur, Kaplan, Lydia, Shadyside, and Morgan City, La., and two at Houma.

Gulf Refining Completes New Crude Line to Mobile

MOBILE.—Gulf Refining Co. has completed an 80-mile, 14-in. crude line from Eucutta, Heidelberg, and Baxterville fields in Mississippi to a terminal here.

Tankers will carry the crude from Mobile to the company's refineries on the Gulf and Atlantic coasts. The first tanker was loaded at the terminal last week.

Gulf also has built a loading wharf and erected six 80,000-bbl. storage tanks at the terminal.

Pipe-Line Briefs

Lakehead Pipe Line Co., Inc., will erect twelve 277,000-bbl. tanks at its Superior, Wis., lake terminal during 1952. Construction of tanks has been contracted by Chicago Bridge & Iron Co. This tankage will provide additional capacity for storing oil received by the Lakehead system from the Interprovincial Pipe Line Co. trunk line from the Edmonton area.

Hunt Oil Co. is reported planning construction of a 9-mile, 4-in. pipe line from North Shongaloo oil field to Haynesville, La. It would connect with Interstate Oil Pipe Line Co.'s pumping station near the Haynesville operators' committee plant. North Shongaloo crude is now trucked from the field to Interstate's line.

Cities Service Gas Co. has applied to the Federal Power Commission to build about 21 miles of natural-gas lines in Franklin and Anderson counties, Kansas, and to add a 1,000-hp. compressor unit at its Welda station in Anderson County. The projects would cost about $1,202,500.

NATURAL GAS

Texas Tax Take

Another firm joins those filing protested payments

HOUSTON.—The November lineup of firms paying Texas' controversial gas-gathering tax under protest remained relatively unchanged from October, complete tabulations from the state comptroller's office showed last week.

Mississippi River Fuel Corp., which is just now beginning to take large quantities of gas from Woodlawn gas field in eastern Texas, was the only major addition to the list of protesting companies.

Protested payments in November totaled $561,461.55 from 77 gas gatherers, and $409,126.59 was payed without protest by 117 companies. Colder weather increased the total take during the month to $970,588.14 against $921,227.44 in October.

Those firms protesting payment in September and October numbered 78 and 76, respectively.

State action.—Speaking of suits filed by seven firms recently attacking constitutionality of the tax *(The Oil and Gas Journal, January 7, 1952, page 51)*, Texas Gov. Allan Shivers said last week that he still intends to call the state legislature into special session if it is seen that the state will go into the red by losing the tax revenue.

In scheduled conferences with the comptroller and attorney general, Shivers said he would seek opinions on effects of the suits and how long it will be before a final court decision can be had. Indications are that the general fund will be close to a deficit in May but should regain a balance in June. Whether a special session will be necessary depends to a great extent on oil production, Shivers said.

Company viewpoint. — In Chicago, a spokesman for Texas Illinois Natural Gas Pipeline Co. said the tax was designed to place the burden on the interstate pipe-line companies rather than the real gatherers of the gas.

He said the law defines gathering as the first taking of the gas at the outlet of a gasoline plant. "In effect, the tax is on the privilege of transporting gas in interstate commerce," and "no lawyer would advise his client to pay a tax that is clearly unconstitutional," he said.

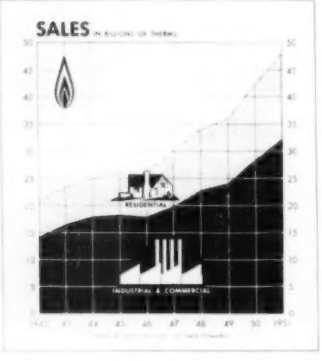
Higher Minimum Price Asked For Guymon-Hugoton Field

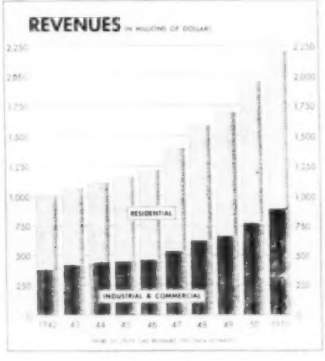
OKLAHOMA CITY.—The Oklahoma State Corporation Commission will hold hearings this week on an application by royalty owners in Guymon-Hugoton gas field, Texas County, for an approximate 3-cent jump in the well-head price of gas produced in the field.

Applicants are seeking a new minimum price of 9.8262 cents per M.c.f. of gas at a pressure base of 14.65 psi. The old 7-cent per M.c.f. minimum price at the same pressure was set by the commission December 9, 1946, and upheld by the state Supreme Court in December 1949.

The commission hearing, set for January 15, will find T. Murray Robinson, Oklahoma City attorney, acting for more than 200 resident royalty owners. The application is based on the corporation commission's reasoning in the 1946 order which was issued "for the purpose of preventing waste, economic and physical, of natural gas for the purpose of protecting correlative rights, and to insure the greatest ultimate recovery of natural gas from the common reservoir involved. . . "

The applicants in the hearing this week will assert that the intrinsic value of gas at the well head for fuel is not less than 10 cents per M.c.f. They will also ask that any new order be more specific and binding than that issued in 1946 to prevent controversies between producers and purchasers.





BIGGEST YEAR.—The natural-gas industry set new records in revenues, customers, sales, and expenditures last year, according to the American Gas Association's annual report. It served 17,167,000 consumers, up 14.2 per cent; spent $1.5 billion, up 67 per cent; sold 44,421,000,000 therms, up 15.4 per cent (a therm is approximately equal to 100 cu. ft.); took in revenues of $1,649,050,000, up 21.2 per cent. The Federal Power Commission o.k.'d construction of more than 12,000 miles of natural-gas pipe line in 1951. In addition to expanding service to areas already receiving gas, the industry pushed out to reach New England. This leaves the Pacific Northwest the only heavily populated area not receiving the fuel, and plans for serving this area may materialize soon.

Natural Gasoline

N.G.A.A. Research Aims at Better Laboratory Analyses

The Natural Gasoline Association of America's fractional-analysis committee has begun distribution of two more liquid samples to 61 oil companies and commercial laboratories participating in a research program which it is hoped will reduce to a minimum human errors in low-temperature analysis of hydrocarbon mixtures.

The new samples, fourth and fifth in the series begun in 1948, will be blended by Phillips Petroleum Co.'s special-products department. Composition of the samples will be unknown to any of the laboratories.

Sample No. 4's composition will range only from C_3 to C_5 inclusive with traces of some components. No. 5's content will range from C_3 to C_7 with four isomers in varying amounts.

Laboratories participating will submit their analyses to the N.G.A.A. secretary. Analyses will be checked to assess the improvement in accuracy made by the laboratories as a result of previous studies and seminar discussions of errors and their causes. Results of the current series will be reported at the association's convention at Houston in April when another seminar on the subject will be held.

Any laboratory desiring to take part should notify N.G.A.A. headquarters immediately at 422 Kennedy Building, Tulsa 3, Okla.

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UNIBOLT

REFINING

Cities Service Places New Orthoflow Cat on Stream

PONCA CITY, Okla.—Cities Service Oil Co.'s new Orthoflow catalytic cracking unit, first of its kind in the United States, was placed on stream here last week.

Shake-down runs on the 8,350-bbl. per day cracker were completed January 1. It is one of the major elements in a multimillion-dollar expansion and modernization program which was started in February 1951 and will boost the refinery's capacity to 20,000 bbl. per day.

The new cracker was designed by M. W. Kellogg Co. and is the second such unit to be put in operation on the continent. The first was completed last summer at Edmonton, Alta.

PAD Sees Enough TEL for Refiners Through January

WASHINGTON. — Present allocations of tetraethyl lead to refiners can be maintained at least through January, according to officials of the Petroleum Administration for Defense.

They are also confident that action taken recently by the National Production Authority and PAD will result in relieving the situation generally. A further encouraging development was NPA's conservation order on automotive batteries. This eliminated some "luxury" grades and may result in saving 5,000 tons of lead this year.

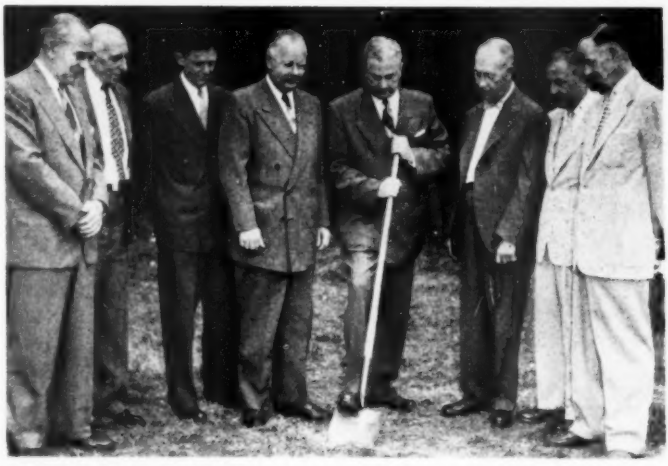
Lead allocations for January to Ethyl Corp., Du Pont, and other consumers were increased slightly by releasing some lead from the defense stockpile.

However, PAD thinks the real struggle to get enough lead for TEL will not begin until new TEL-manufacturing facilities are placed in operation. This will require a considerable increase in over-all allocations of lead for TEL.

New, Higher Federal Taxes Hike November Oil Revenues

WASHINGTON. — New and increased levies which went into effect November 1 boosted the Treasury's revenue from the taxes on oil in November.

Partly as a result of the increase from 1½ to 2 cents per gallon in the rate and the imposition of a floor tax to catch the increased rate on stocks on hand, the Internal Revenue Bureau reported the November revenue from gasoline was $57,999,733



CONSTRUCTION KICKOFF.—William B. Logan, The Texas Co.'s manager of refinery operations, breaks ground for a new administration building during observance recently of the twentieth anniversary of the company's Beacon, N. Y., laboratories. With Logan are (left to right): Carl E. Cummings, superintendent of laboratories; Joseph F. Connor, assistant to the superintendent; R. K. Fiestsam, assistant superintendent; Dr. Wayne E. Kuhn, manager of the technical and research division; Leonard J. Supple, chairman of Dutchess County, New York, board of supervisors; J. Lewis Bolton, mayor of Beacon; and G. William Luther, Jr., mayor of Fishkill, N. Y.

against $47,295,250 in the same month in 1950.

The new tax of 2 cents per gallon on diesel oil brought in an initial revenue of $3,991.

The downward trend in collections from the tax on lubricating oils continued in November and the revenue of $6,670,025 was some $3,600,000 under the $10,301,637 secured in the same month of the previous year.

Collections from pipe-line transportation of oil slackened slightly, to $2,524,391 from $2,530,278 in November 1950, the bureau reported.

Fast Tax Writeoff O.K.'d For New Pan-Am Facilities

WASHINGTON.—Accelerated amortization has been granted by the Defense Production Administration on a $2,895,000 investment to be made by Pan-Am Southern Corp. in gasoline-production facilities at El Dorado, Ark.

Certificates have been granted for quick writeoff at rates of 90 per cent on $118,000, 65 per cent on $2,210,000, 45 per cent on $467,000, and 15 per cent on $100,000.

Certificates also have been granted the National Petro-chemicals Corp. on $14,884,725 to be invested for production of ethane and propane at Tuscola, Ill., at the rate of 65 per cent on $7,849,000, 50 per cent on $3,701,000, 40 per cent on $2,304,725, and 15 per cent on $450,000.

Refining-Dividend Payments Running Well Ahead of 1950

WASHINGTON.—Publicly reported cash-dividend payments by oil-refining corporations dropped to $4,600,000 in November from $10,000,000 in November 1950, but the total paid in the first 11 months of the year reached $628,400,000 compared with $520,500,000 in 1950, according to Department of Commerce estimates.

The trend in refinery dividends was in line with that of industry generally. Only 4 of the 11 manufacturing categories separately reported by the department showed an increase in November over the same month a year before while 6 industries reported decreases and 1 (chemicals) showed identical disbursements for the 2 months.

Refining Briefs

Kerr-McGee Industries, Inc., has signed a contract for operation of Sunray Oil Corp.'s asphalt facilities at its Duncan, Okla., refinery. The deal also gives Kerr-McGee the right to handle sales and distribution of the products. Together with products marketed from Kermac's own Wynnewood, Okla., refinery, the contract will boost the company's sales to about 5,500 bbl. daily.

Among the Drilling Contractors

Sharp Drop Reflected in Number of Operating Rigs

Reflecting normal seasonal trends and bad weather conditions in most areas, the number of rotary rigs operating in the United States and western Canada dropped sharply during the week ended January 7 (latest report), putting the total below the 3,000 mark for the first time since early in October. Active rigs reported during that week totaled only 2,973, a decline of 87 from the previous week's report. All except two of the additional non-operating rigs were in areas of the United States, where the total declined 85 rigs from the 2,898 rigs reported operating the previous week to 2,813 rigs running during the current period.

The greatest single drop by areas was in the Illinois basin region where the number of rigs declined during the week from 126 to 77, a decrease of 49. Oklahoma was second with a decline of 24 in operating rigs. The Rocky Mountain region, where extreme cold weather might be expected to curtail drilling, reported an increase in active operations. The Arkansas-North Louisiana - East Texas area was the only other district to show a gain.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area—	Week ended 1-7-52	Change week ended 12-31-51	Change week ended 1-8-51
Gulf Coast	638	— 5	+102
W. Tex.-N. M.	1,056	— 7	+287
Ark.-N. La.-E. Tex.	192	+ 1	+ 45
Oklahoma	333	—24	+ 49
Kansas-S. Nebraska	165	— 6	+ 29
Illinois-Eastern	77	—49	— 46
Rocky Mountains	173	+ 5	+ 63
Pacific Coast	179	0	+ 50
Total United States	2,813	—85	+579
Western Canada	160	— 2	+ 60
Total	2,973	—87	+639

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the West Texas-New Mexico and Oklahoma-Kansas areas are shown on pages 160 and 161.

Coats Drilling Co., Longview, Tex., is drilling for Union Oil Co. of California at a wildcat location 6 miles west of Gladewater, in Smith County, eastern Texas. The test is 1 Morrison. Location is in the S. J. Lott Survey. This contractor also has a new operation under way in the Deupree field, 2 miles southeast of Pine Mills, Wood County, also in eastern Texas, where it is drilling for Texas Crude Oil Co. The latter well, projected to 5,200 ft., is 1 Westgate-Greenland, in the J. B. Tucker Survey.

New Drilling Company Has North Dakota Job

Loyd F. Worley, vice president, and Paul R. Peterson, secretary-treasurer, Foundation Oil Co., Tulsa, and Burrell Harrell, formerly general drilling superintendent, Fred M. Manning, Inc., Denver, have formed a new drilling contracting company to operate as Worley & Harrell, Inc. Worley is president, Harrell, vice president, and Peterson, secretary - treasurer. Main offices will be maintained both at Tulsa and Casper, Wyo.

The firm is starting with one new heavy-duty rotary rig, which now is located in the Beaver Lodge field, near Tioga, in Williams County, North Dakota, where it is drilling for Amerada Petroleum Corp. Two additional rigs are expected to be put in operation shortly. Harrell is in direct charge of drilling and now is staying at Williston, N. D., looking after the Beaver Lodge well.

Rainbow Drilling Co., El Dorado, Ark., has contracted for a 6,500-ft. wildcat test to be drilled for Singer Manufacturing Co. and Curtis Kinard at 1 Chicago Mill & Lumber Co., in 26-15n-10e, 3½ miles east of the Indian Lake field, Madison Parish, Louisiana.

Clark Drilling Co. has the contract for the wildcat test which H. L. Hunt is starting in Ward County, North Dakota. Location is on the operator's Joe Wold lease in the C SE SW 23-155n-81w.

Nuckolls - Bell Drilling Co., Oklahoma City, has contracted with Arthur B. Ramsey, also of Oklahoma City, for a Wilcox test of the old, spotted, shallow gas producing area of the Thomas field, in southwestern Kay County, Oklahoma. Objective of the test, 1 Fruits, SW NE NE 3-25n-2w, is expected about 5,000 ft.

Bass Drilling Co., Houston, is starting a new well for Humble Oil & Refining Co. in the LaGrange field, Adams County, Mississippi. Latest operation is 3 Ratcliff, in 44-7n-2w.

C. A. Lee, Gladewater, Tex., is starting a Travis Peak test at a wildcat location 2 miles west of Milner, northern Columbia County, Arkansas. The test, 1 Wepfer, in 33-15s-20w, is

the most versatile tool available

FOR ACTIVE DRILLING RIGS

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FISHING:

Easily picks up any fish or junk that can be lost in hole; brings up capacity loads everytime.

DRILLING: Makes straight, full-gauge hole in all type formations, all the way to bottom. A perfect tool for taking core samples.

REAMING: Milling action of teeth on side wall assures perfect reaming job; eliminating further reaming.

GLOBE patented JUNK CATCHER

Designed primarily as a fishing tool for fast, easy recovery of all types of loose junk in the hole, the Globe patented Junk Catcher also has proved exceptionally efficient for drilling full-gauge hole, taking core samples, and reaming. It is, therefore, one of the most versatile and useful, as well as valuable tools available for active drilling rigs. It is extremely simple in design, construction and operation . . . any drilling crew can run it with full assurance of maximum efficiency and recoveries.

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a contract job for Passwaters, Whaley & McLaughlin, independent operators of Stephens, Ark. Location is 2¾ miles west of the Stephens field. Contract is for 4,000 ft.

Dorris Ballew, Inc., Natchez, Miss., has two new wildcat operations under way in Wilkinson County, southwestern Mississippi. One, 1 Robinson, located in 29-2n-1e, 2 miles northeast of Centerville, is being drilled for G. A. Clements and associates. The other, 1 d'Aquilla-Sessions unit, in 52-2n-3w, 4 miles south of Lessley, also is a Clements contract.

Cable Tool & Rotary Drilling Co., Tyler, Tex., has a rotary rig working for Magnolia Petroleum Co. on a wildcat job 1½ miles northwest of Lindale, in Smith County, eastern Texas. Location is on the operator's King lease in the J. H. Sanders Survey.

Rowan Drilling Co., Fort Worth, is among southwestern drilling contractors which have entered the Williston basin activity in North Dakota. It now has a rig working for Amerada Petroleum Corp. at 1 Josie Knutson, C NE NE NE 36-156n-96w, Williams County.

John Brorby, Newcastle, Wyo., is starting a Leo sand test for Crusader Oil Co. and associates at a wildcat location in the East Buck Creek area, Natrona County, Wyoming. The new operation is on a government lease with location in the NW NW SE 17-36n-63w.

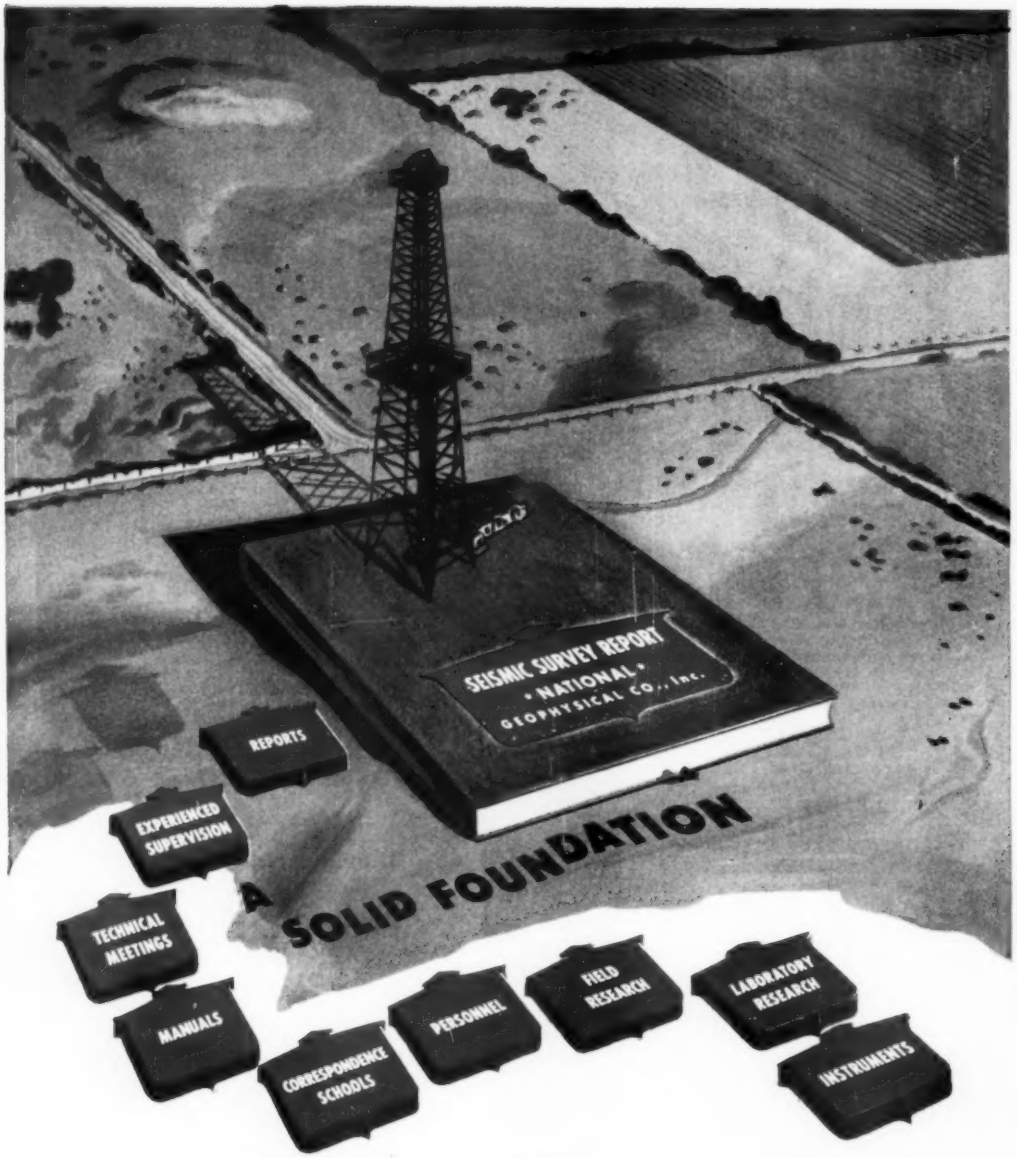
Justiss-Mears Drilling Co., Jena, La., is moving a rig to a wildcat location about 3½ miles southwest of the Willow Lake field, Catahoula Parish, Louisiana, where it has a contract with J. S. Michael Co. and Ashland Oil & Refining Co. to drill a Wilcox sand test, 1-P Nebo, in the C SE SE 17-6n-6e. It also is starting another well for Carter Oil Co. in the Larto Lake field, same parish, at 3-D Tensas Delta, C SW SE 14-5n-5e.

McAlester Fuel Co., Magnolia, Ark., is drilling another wildcat for Hunt Oil Co. in the Elliott area, Ouachita County, Arkansas. The new operation, 1 Daniels, C NW NE 27-14s-17w, is about 1¼ miles northeast of a dry hole, 1 Berg estate, recently drilled for the same operator. The location is about 2 miles northwest of the town of Elliott.

Belt & Lanier tools are being used by Kemmerer and associates at their 1 State, a wildcat located in the E½ SW NE 16-32n-81w, in the Goose Egg area of Natrona County, Wyoming.

Peterson Drilling Co., New Orleans, is drilling for Lion Oil Co. at 1 Anderson, a projected 7,000-ft. wildcat test, located 2 miles southwest of the South White Apple field, in 18-5n-1e, Franklin County, Mississippi.

Fortenberry Drilling Co., Natchez, Miss., has contracted with F. F. Mellen and J. F. Michael for a lower Cretaceous exploratory test to be drilled at a wildcat location 1¼ miles southwest of Vernon, Jasper County, Mississippi. Location is for 1 Alexander estate, in the C SE SW 21-1n-11e. Objective is expected around 6,700 ft.



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LEADING THE FIELD OF SEISMIC EXPLORATION

Exploration and Drilling

"Forecast" for '52

LAST year at this time Amerada Petroleum Corp. 1 Iverson was drilling at about 11,000 ft. in North Dakota's Devonian rocks. At that time who could have predicted that within 1 year Mississippian oil would be produced from 7,150 ft. in that hole and that Mississippian rocks would be the primary objective of a number of Williston basin wildcats?

A method for forecasting the results of specific exploratory ventures has yet to be worked out, and until such a method is developed oil searchers must continue to be optimistic about unknown areas if rank wildcats are to be drilled.

Right now there is plenty of that necessary optimism and rank wildcats are being drilled or plans to drill them are being formulated. This means that oil will probably be found in some new area during the coming year. That area may be in Oregon, Arizona, or in the Basin and Range province of western Utah, eastern Nevada, and southern Idaho; in the Delaware basin or in South Dakota; in Georgia, South Carolina, in eastern Pennsylvania, or off the coast of New Jersey; or—somewhere else.

Without attempting to forecast, but rather to summarize a few of the highlights of what exploration men see, here are the newer areas that appear destined to rank high in exploratory interest during the current year.

The Williston basin, the big noise of 1951, has a long way to go before it can become an important oil-producing state, but it has made unbelievable progress in the past 9 months and it looks as though it will go a lot farther; 1952 developments should substantiate this.

Another comparative newcomer to the list of producing basins is the Uinta of Utah. Two additional discoveries during 1951 and development of Roosevelt, which has already been enlarged beyond what some considered an overoptimistic picture of that field's estimated productive outline, point to a great future for this basin. Additional discoveries should feature 1952.

Without question the most talked-about formation in the country during 1951 was Midland basin's Spraberry sandstone. Just what this rock lens can mean to the United States is still a big question mark. Just how far development drilling can go in this sand is going to depend on pipe availability, and that doesn't look too promising. The oil's already been found here—exploratory work is going to be on methods for getting that oil to the surface.

In the same basin more deep structures in the Pennsylvanian and Ordovician rocks will probably be found and major extensions made to the few already discovered.

In southeast New Mexico more Devonian structures with hundreds of feet of porous limestone may be discovered. These Devonian fields are expected to edge north and northeastward around the Central Basin platform. Up in the northwestern part of the state, the San Juan basin, which some have pointed out as being about where West Texas was 20 years ago insofar as concentration of exploratory drilling is concerned, appears extremely promising for discoveries in horizons deeper than those from which tremendous reserves of gas are now being developed.

There will continue to be discoveries in the Julesburg basin. This constantly expanding province is apparently going to be developed in long, narrow trends. No indications that big fields will be found here have been noted but, with or without big fields, the Julesburg basin is going to see a percentage gain in importance as 1952 rolls on.

In Oklahoma near the end of last year, the discovery of oil in Beaver County of the Panhandle indicated that amazing results from this area may be expected for this year. Look for these results to the east into Oklahoma and northeast into Kansas where several discoveries in recent years point out the potentialities of this big open area to the east of the vast Hugoton gas field.

The gas-condensate well completed in the State of Washington, though not spectacular in itself, cannot be overlooked as indicating what may be in store for an area of significant size. Also the finding of gas in pre-Cretaceous rocks in northern Mississippi throws new light on the potentialities of the buried end of the Appalachian Mountains.

This list is just a starter—add your own pet areas to complete it.

Philip C. Ingalls.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

SASKATCHEWAN.—The highest grade of crude oil so far found in Saskatchewan was discovered this week in the southwest sector of that province. The new find was made in the Lower Cretaceous rocks at Socony-Western 1 Prairie-Roseray, in LSD 2, 10-17-18w3. The initial test, from 3,070-3,100 ft., gave up 3,070 ft. of clean 24°-gravity oil in 30 minutes.

WEST TEXAS.—Magnolia Petroleum Co. 1 Bertha Nolley, outpost to Wolfcamp discovery in Andrews County, kicked off and flowed 40 bbl. of new oil in 9 hours. Pay section was from 8,129-59 ft. Indian Royalty Co. 1 Roberts, Spraberry discovery in northwest Reagan County, made flowing potential of 417 bbl. of oil through 32/64-in. choke from open hole at 6,709-6,991 ft.

EAST TEXAS.—Tom Potter 1 Cock, Harrison County gas-distillate discovery, prepared for completion. Gas volume had increased and estimated flow was over 50,000,000 cu. ft. daily, with high distillate yield.

ROCKY MOUNTAIN AREA.—Pure Oil Co. is coring below 16,397 ft. for the Nugget at West Poison Spider, Wyoming. The well found saturation in cores of the Lakota at around 16,000 ft. Husky Oil Co.-Wilshire Oil Co. have cemented casing following oil and gas recoveries in the Phosphoria at their Big Horn Basin, Wyoming, wildcat.

Eastern Texas

First Crude Production is Seen for Prairie Lake

DALLAS.—First crude oil production for the Prairie Lake distillate field of Anderson County, southwest of Tennessee Colony, was in prospect at Continental Oil Co. 1-A J. S. Carroll, E. C. Harris Survey.

First test after acid treatment through perforations at 8,835-8,933 ft. in the Rodessa section developed a flow of 100 bbl. of oil a day through 18/64-in. choke. However, gravity and gas-oil ratio had not been reported. The well had made a gas-distillate flow higher in the Rodessa.

Completion tests were under way at Tom Potter (formerly Skeeters & Curry), 1 W. T. Cock, wet-gas discovery 9 miles southeast of Hallsville in Harrison County. The well was flowing to clean, following acid treatment, and no gage was available on the volume, but estimates previously made of around 20,000,000 cu. ft. daily had been upped to 50,000,000 cu. ft. and above. Distillate yield was figured around 50 bbl. per 1,000,000 cu. ft. The rich pay was a 10-ft. section in the lower Pettit around 6,700 ft.

In the Woodlawn area of Harrison County, R. W. Fair 2 Medine, J. Bowman Survey, completed as a gas-distillate producer, making 9,200,000 cu. ft. of gas a day plus 52 bbl. of distillate per 1,000,000 cu. ft. Pay zone was the Pettit lime at 6,444-6,504 ft. Location is on the northeast end of the field, and about 1 mile north of the firm's 1 Medine, an oil producer.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Denton County: William H. Hunt 1 Alta Johnson, A. Campbell Sur. A-228, dry, TD 1,934 ft.

Placid Oil Co. 1 R. E. Fisher, W. P. Johnson Sur., A-680, dry, TD 2,238 ft.

Southwest Texas

Potential Test Run on New Pay in Hidalgo County

CORPUS CHRISTI.—Potential test has been run on a new pay sand discovery in Sullivan City field, Hidalgo County. Phillips Petroleum Co. 1 Garza F. Flores, Porcion 39, flowed 1,344,000 cu. ft. of gas daily from the Vicksburg at 4,970-5,010 ft. The well also produced some 58.8°-gravity distillate.

A new upper sand is indicated in the Hostetter area of McMullen County, at Sunray Oil Corp. 1 Yeager, confirmation test to the field. Shows were reported on sidewall cores taken at 9,228, 9,221, 9,185, 9,152, 9,032, 8,761, 8,755, 8,750, 8,745, and 8,590. This well is located 3,100 ft. northeast of 1 Hostetter gas discovery, which was completed at 10,088 ft. Electric log was run in 1 Yeager and coring was resumed.

Plymouth Oil Co. G-6 Welder, outpost to Portilla field, San Patricio County, has been potentialed for 102 bbl. of 41.5°-gravity oil daily through 3/32-in. choke. Well is producing from perforations at 7,142-44 ft. and 7,146-52 ft. Hole is bottomed at 7,335 ft. with 5½-in. casing set at that depth.

C. G. Glasscock 1 Osca Daskam, wildcat on the Hidalgo County side of Flores field, flowed 15,500,000 cu. ft. of gas daily plus some distillate. Well is producing from the Sullivan sand at 4,432-44 ft. This well is located 3,900 ft. southeast of Texas Co. 1 Yturria gas well.

Gulf Plains Corp. 1 W. B. Moble, wildcat 2½ miles southwest of Robstown in Nueces County, is drilling ahead at 8,502 ft. after recovering gas-distillate on dril-stem test. Test was conducted at 8,310-35 ft., using ¼-in. chokes, and well flowed gas and distillate with tool open 15 minutes. Working pressure was 925 psi, and bottom-hole flowing pressure registered 325 psi. This prospective discovery is located in George H. Paul Subdivision of Driscoll Ranch, Section 34.

In Bastrop County, Thomas Jordan, Inc., 1 H. N. Bell, Jr., wildcat 2 miles northwest of Sayersville, flowed at the rate of 25 bbl. of oil hourly, with a potentiality of producing 400 bbl. of oil per day. Production is near 3,042-3,150 ft. where previous drill-stem test recovered 1,963 ft. of heavy oil.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT SUCCESSES

Atascosa County: Oil discovery, "W. Pruitt area"—Humble Oil & Refining Co. 1 J. H. Jones, H&GN RR Sur. 75, A-421, TD 5,085 ft., open hole 4,966-80 ft., IP: 63 bbl. oil per day, ¼-in. choke, 37.8° gravity.

Brooks County: New pay at Rachal—Baldridge & King, Inc., 1 D. H. White, Share 7, Part of La Escantada & Encino Del Pozo Grants, TD 4,894 ft., perf. 4,795-4,803 ft., IP: 57 bbl. oil per day, 46° gravity.

San Patricio County: Gas discovery—H. R. Smith & Southwestern Oil & Refining Co. 1 William C. Matula, Geo. H. Pauls Subd. of Coleman-Fulton Pasture Co. Lands, Sec. 52, TD 6,016 ft., perf. 3,828-32 ft., IP: 3,080,000 cu. ft. of gas daily, 5/16-in. choke.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Brooks County: Daubert & Achning 1 A. Ramirez, Encino Del Pozo Grant, Share 12, Tract 7, dry, TD 5,030.

Duval County: W. H. Hunt 1 W. C. Gravis, Sec. 88, A-1649, dry, TD 5,120 ft.

Marine Gathering Co. 1 Hinojosa, BS&F Sur., A-649, dry, TD 7,025 ft.

Arnold O. Morgan 1 W. N. Turner, Jose Marcelo Hinojosa Grant, A-628, dry, TD 5,846 ft.

The Texas Co. 1 First State Bank of Mathis, et al, S. Blankenship Sur., A-1,593, dry, TD 5,002 ft.

Gillespie County: C. C. Williams 1 O. Hopf, Marsha Norrad Sur. 219, Subd. 6, dry, TD 610 ft.

Gonzales County: Producers Corp. of Nevada 1 E. S. Austin, John A. Winn Sur., dry, TD 6,248 ft.

Guadalupe County: James N. Eddy 1 Wundt, Robert Hall Sur., A-157, dry, TD 2,554 ft.

Jim Wells County: Paisano Trading Co., Ltd., 1 Charles Muil, R. King Sur. 60, A-262, dry, TD 5,517 ft.

Starr County: Dulaney Oil Co. 1 F. M. Seabury, Porcion 107, Share 1, dry, TD 3,308 ft.

Williamson County: J. B. Dittoe 1 A. A. Galler, Pedro Zarza Sur., dry, TD 900 ft.

North Central Texas

Good Flowing Well Completed in Nolan County

WICHITA FALLS.—Second completion on the Billie Hanks ranch of southeast Nolan County, (Hylton-Strawn field), has completed as a good flowing well, and according to reports, checked higher on the Strawn than the discovery.

The new producer is Seaboard Oil Co. 1-A Hanks, 28-Z-T&P, a west offset to the field discovery. Top of the Strawn limestone was 5,355 ft., minus 2,945 ft., and 92 ft. higher than Seaboard and Continental 1 Hanks. Completion was through perforations at 5,444-57 ft. and potential through ¼-in. choke was 249 bbl. of oil a day. Flowing pressure was 615 psi.

North of Blackwell, General Crude Oil Co. 1 Elmer Jordan was dry at 6,607 ft. in sand. Drill-stem test at 5,842-5,901 ft. developed 150 ft. of slightly gas-cut mud and 220 ft. of salt water.

In northeast Nolan County, Rowan & Hope completed 1 J. T. Seago as a Canyon reef discovery. Final gage was 144.17 bbl. of 43°-gravity oil through ⅝-in. choke, from casing perforations at 6,196-6,393 ft. Location is 3 miles west of Sweetwater in 43-22-T&P.

Location for a south offset was staked by Eastern States Petroleum Co., Inc., as the 1 Fred C. Daugherty. A rotary was being moved in to start drilling on a 6,500-ft. contract.

Completion gage was turned in for Cox Drilling Co. 1 Veretto, conglomerate discovery 3 miles northeast of Montague in the MEP&P Survey, A-513. Potential, on the pump, was 38.74 bbl. of 40°-gravity oil from pay at 6,469-76 ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT SUCCESSES

Clay County: Frank Wood Associates 1 L. L. Kerr, 57-A-368-Orange CSL, TD 6,695 ft., elev. 987 ft., conglomerate pay 6,122 ft., IP pumped 140½ bbl. 43°-gravity oil.

Montague County: George E. Engle 1 Carminati, T. A. Stout Sur., A-1,190, TD 6,434 ft., pay 5,840-46 ft., IP 72 bbl. 40°-gravity oil, 12/64-in. choke, TP 75 psi., GOR 100 cu. ft.

Shackelford County: Jesse L. Douglas 1 A. L. Black, Sec. 4, BAL Sur., TD 826 ft., pay 817 ft., IP pumped 8 bbl. 36°-gravity oil.

Stephens County: J. E. Connally 1 Bessie Curry, 13-7-T&P, TD 2,480 ft., elev. 1,350 ft., pay 2,320-33 ft., IP 30½ bbl. 36°-gravity oil, ½-in. choke, GOR 830 cu. ft., TP 120 psi.

Miami Operating Co. 1 Stover, 4-8-T&P, TD 4,614 ft., elev. 1,184 ft., Mississippian

reef 4,405 ft., pay 4,440 ft., perforated 4,480-83 ft., IP pumped 43 bbl. 43°-gravity oil.

Stonewall County: Chapman & McFarlin 1 M. A. Baldwin, 15-D-H&TC, TD 4,319 ft., perforated 3,954-4,140 ft., IP pumped 97 bbl. 41°-gravity oil.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Jack Dennison 1 Jentsch, Blk. 115, Harris Subd., Club Ranch, dry, TD 1,500 ft.

Russell Maguire 1 Hulse, W. S. Blount Sur., dry, TD 5,071 ft., Mississippian 5,060 ft.

J. B. Palmer 1 J. R. Parkey, Blk. 1, SPRR Sur., dry, TD 1,734 ft.

Harry Snebold 1 M. H. Taylor, 15-17-ATNCL, dry, TD 1,657 ft.

Timberlake, Kelleher & Scott 1 H. O. Prideaux, John Dorsey Sur., dry, TD 3,743 ft.

Timberlake, Kelleher & Scott 1 E. R. Steen, C. Ballinger Sur., dry, TD 853 ft.

R. Clay Underwood 1 Bill Street, Blk. 106, Jefferson CSL, dry, TD 1,152 ft.

Callahan County: E. L. Doheny 1 P. G. Hatchett, 1-1-Seale & Morris Sur., dry, TD 4,457 ft., elev. 1,820 ft., Bend 4,170 ft., Ellenburger 4,410 ft.

Coleman County: Louis Franklin 1 Mrs. Annie Weaver, Wm. Farris Sur. 279, dry, TD 1,529 ft.

Cooke County: D. H. Bolin 1 Joe Fisher, Eben Reed Sur., A-849, dry, TD 1,650 ft.

Wm. V. Dyer 1 Mary Voth, M. Lawson Sur., dry, TD 2,019 ft.

Eastland County: Ray C. Liversay 1 S. L. Moore, L. T. Vann Sur., dry, TD 3,555 ft.

Haskell County: P. S. Kendrick 2-B Hendrick, 1-A-AB&M, dry, TD 4,501 ft.

Jack County: Billy Bridwell 1 Fannie Knox, A. Harris Sur., A-2,421 ft., dry, TD 2,615 ft.

S. D. Johnson 3 J. R. Clayton, Sec. 3,844, TE&L Sur., dry, TD 4,990 ft., Caddo 4,540 ft., Marble Falls 4,960 ft.

Jones County: Viking Oil Corp. 1 W. A. Stanley, Sec. 29, OAL Sur., dry, TD 3,728 ft., elev. 1,706 ft., King 2,470 ft., Swastika 2,590 ft., Palo Pinto 3,656 ft.

Knox County: Youngblood & Foree 1 Masterson Bros., 6-1-H&GN, dry, TD 5,497 ft.

Nolan County: General Crude Oil Co. 1 Elmer Jordan, 24-x-T&P, dry, TD 6,608 ft., reef 4,661 ft., KMA 5,646 ft., Ellenburger 6,404 ft.

Montague County: Mid-Continent Petroleum Corp. 1 S. L. Savage, R. Toullis Sur., dry, TD 6,244 ft., Caddo 6,044 ft.

San Saba County: Mack H. Yates 1 Yates, W. A. Ryan Sur., dry, TD 1,100 ft., Hickory 850 ft., granite 1,100 ft.

Shackelford County: J. L. True 1-A Snyder, Sec. 25, LAL Sur., dry, TD 805 ft.

Stephens County: Louis Mabee Co. 1 Martha Thorp, Jacob Kyle Sur., dry, TD 3,700 ft.

Wilgerigan Oil Co. 1 C. M. Guest, 30-6-T&P, dry, TD 2,578 ft.

Stonewall County: Columbia Fuel Corp. 1 R. C. Smith, 148-1-H&TC, dry, TD 6,363 ft., Strawn 5,569 ft., Ellenburger 6,333 ft.

Jake L. Hamon 1 Harris Hospital, 279-D-H&TC, dry, TD 6,875 ft.

Taylor County: Western Petroleum Co. 1 Garland Jones, Blk. 104, W. E. Vaughn Sur., dry, TD 4,607 ft.

Throckmorton County: Consolidated Oil Co. 1 C. Forman, Sec. 3,017, TE&L Sur., dry, TD 4,982 ft.

Woodson Oil Co. 1 W. Brown, Sec. 191, BBB&C Sur., dry, TD 5,044 ft.

Wichita County: W. R. Simpson 3 A. W. Brockreil, MEP&P Sur., A-230, dry, TD 2,000 ft.

Wilbarger County: Baker Properties 1-B Webb, 8-5-H&TC, dry, TD 2,504 ft.

I. Dee Campbell 1-B. Waggoner, 1-A534-SPRR, dry, TD 2,002 ft.

I. Dee Campbell 1-C Waggoner, 37-4-SP-RR, dry, TD 2,006 ft.

Young County: M. W. Blair 1 Shanafelt, Blk. 2, Sec. 2,173, BBB&C and W. H. Price Sur., dry, TD 575 ft.

Cabot Carbon Co. 1 W. A. Cyckman, TE&L Sur. 747, dry, TD 3,854 ft.

Cox Drilling Co. 1 Adam Furr, Sec. 339, TE&L, dry, TD 4,965 ft., Barnett shale 4,684 ft., Marble Falls 4,770 ft.

Henry Grace 1 Graham Stewart, BBB&C Sur., A-35, dry, TD 868 ft.

California

Fourth New Zone Opened In Castiac Junction Field

LOS ANGELES.—At the Castiac Junction field of northwestern Los Angeles County, which is proving to be probably the outstanding California oil discovery of the past 2 years, Humble Oil & Refining Co. was in the process of giving the field its fourth producing horizon. While the zone's areal extent is yet to be determined, from the viewpoint of permeability and net oil thickness it promises to be the field's most important.

The new zone opener was Humble 8 Newhall Land & Farming in SE NW 24-4n-17w, located about midway along the 2-mile trend of production which has been established on the southeast dipping anticline. It topped the new pay at 10,795 ft. and cored about 150 ft. net oil sand above 11,000 ft. A formation test at 10,862-84 ft. indicated the discovery would make a substantial producer of 30°-gravity crude.

Presence of the new Mohnian sand was proved by Humble 6 N. L. & F., a northwest offset to No. 8. The former cored about 120 net feet of oil sand but was carried deeper and completed in the field's deepest zone, an oil-condensate pay found at about 11,800 ft. Humble's four oil producers about ½ mile down structure from these two wells were completed in stratigraphically shallower pays. Thus just how far down the nosing the new zone extends is yet to be determined.

At Castiac Hills some 4 miles northward, The Texas Co. completed 1 Honor Rancho-2 as a ¾-mile southeast extension to the discovery. Located midway between the Castaic Hills discovery and its Honor Rancho field, the extensioner indicates production might be continuous along a 2-mile southeast-northwest trend.

This possibility was further heightened by a formation test at Texaco 8 Honor Rancho. A northern extension to Honor Rancho production and ¾ mile southeast of the Castaic Hills extensioner, it flowed at the rate of 2,100 bbl. of 37°-gravity crude on a formation test at 6,214-6,397 ft. Its location is in NW 6-4n-16w.

The Castaic Hills extensioner, in SE 36-5n-17w, flowed 500 bbl. daily of 31°-gravity crude through a 20/64-in. choke. It was completed in the same zone as the Sterling 1 Rynne-Fisher discovery at 5,835-5,950 ft. About ¼ mile west, and ¼ mile south of the discovery, Richfield Oil Corp. was in the process of completing 1 Golden to give the field its third producer.

In San Joaquin Valley, wildcatting developments included starting two deep wildcats in the Coalinga area of Fresno County. About 1 mile north of Coalinga production, Universal Consolidated Oil Co. moved in equipment for a 9,500-ft. Gatchell sand test. Labeled 27-31 Seaboard-S.P., it is located in 31-18w-16e, where Universal jointly with Seaboard Oil Co. holds a lease block of about 2,500 acres. The second test started was the Steele Petroleum Co. 1 Coalinga Nose. Staked in NE 24-20s-15e, or just outside the Coalinga Nose unit, the extension attempt will seek the Gatchell sand at about 8,000 ft.

On the southeast end of the valley Havenstrite Oil Co. completed 1 Richards in a Santa Margarita sand at 6,785-6,913 ft. for 200 bbl. Located in 22-31s-29e, the successful wildcat is 1 mile west of the Arvin discovery well. The Texas Co. 1 George Havenstrite will drill 2 Richards as an eastern offset to its extensioner. About 1 mile southeast of the discovery, C. B. Behr started 1 Berge in 24-31s-29e.

CALIFORNIA WILDCAT SUCCESSES

Kern County, Elk Hills field, new Carneros (Miocene) zone discovery: Standard Oil Co. X-55 30 R. NW SE 30-30s-23e, flowed 134 bbl. per day through perforations at 9,401-9,565 ft., 32°-gravity crude, 50 per cent cut, TD 12,856 ft., plugged back to 9,570 ft., elev. 1,332 ft.

Arvin field, 1 mile west extension: Havenstrite Oil Co. 1 Richards, SW NE 22-31s-29e, flowed 208 bbl. per day through perforations at 6,785-6,913 ft. in Santa Margarita sand, 36.4°-gravity crude, 0.2 per cent cut, 14/64-in. bean, TD 6,958 ft., elev. 462 ft.

CALIFORNIA WILDCAT FAILURES

Fresno County, Raisin City area: Sunset Oil Co. 1 Renee Morris, 13-15s-17e, dry, TD 4,718 ft.

Kern County, Kern River area: Standard Oil Co. 1 "33," 1-29s-27e, dry, TD 7,014 ft., elev. 578 ft.

Los Angeles County, La Mirada area: The Texas Co. 1 McNally Ranch, 23-3s-11w, dry, TD 10,280 ft., elev. 142 ft.

San Luis Obispo County, Hovey Hills area: R. S. Lytle 1 Dougherty, 6-11n-24w, dry, TD 9,336 ft., elev. 2,460 ft.

Simmler area: Shell Oil Co. 28-30 McDonald Estate, 30-29s-18e, dry, TD 11,684 ft., elev. 2,070 ft.

Santa Barbara County, Cuyama Valley area: Richfield Oil Corp. 1 J. G. James, 9-9n-26w, TD 11,336 ft., elev. 2,813 ft.

Guadalupe area: Los Nietos Co. A-3 LeRoy, 22-10n-36w, dry, TD 6,350 ft., elev. 135 ft.

Lompoc area: Murphy Bros., Ltd., 1 "Well," 34-8n-34w, dry, TD 3,240 ft., elev. 948 ft.

South Louisiana

New Oil Pool Opened In Cameron Parish

NEW ORLEANS.—A new oil pool has been opened west of Chalkley field, Cameron Parish, at Caroline Hunt Sands 1 Sweetlake Land & Oil Co., 9-12s-7w. Well was drilled to 11,932 ft. and operator perforated 9,384-89 ft. Through a 10/64-in. choke, the well flowed 150 bbl. of 44.4°-gravity oil daily, on state potential test. Tubing pressure registered 1,050 psi.

Five miles west of Reeves field, Allen Parish, Niloco Co. and Bel Oil Corp. 1 Stout Realty Co., 19-6s-7w, has opened a new oil producing area. Operators perforated at 5,220-24 ft., and at last report were preparing to run potential test. It was estimated that the well would produce approximately 80-100 bbl. of 25°-gravity oil per day through a 7/64-in. choke.

Approximately ½ mile west of this discovery, same operators have staked location for 1 Edgewood Land & Logging Co., 19-6s-7w, which will be drilled to 5,200 ft.

Sohio Petroleum Co. has completed and shut in its new gas discovery in St. Landry Parish, 1 Thistlewaite, 64-4s-4e. From perforations at 9,287-91 ft., the well flowed 1,750,000 cu. ft. of gas daily plus an unestimated amount of condensate. Gravity of the condensate was not determined.

W. A. Moncrief has temporarily abandoned his Avoyelles Parish wildcat, 1 Virgil Descant, 31-1n-4e, after production tests showed 20 per cent oil and 80 per cent salt water from perforations at 9,970-90 ft. Efforts to shut off salt water flow failed. Approximately 1,320 ft. to the northwest of the abandoned well, Moncrief is drilling below 3,500 ft. at 1 Lake Pearl Co., 31-1n-4e.

Humble Oil & Refining Co. is drilling below 11,836 ft. at 1 Louisiana Land & Exploration Co. "F," extension attempt to Little Lake field in Jefferson Parish. The venture is located south of the field discovery well which was completed as a

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SOUTH LOUISIANA WILDCAT SUCCESS

Acadia Parish: Gas-condensate discovery, "West Branch"—Sunray Oil Corp. 1 Fred Loewer, 45-8s-2e, TD 11,983 ft., Hackberry 11,178-11,185 ft., IP: 209 bbl. condensate per day, 10/64-in. choke, TP 5,850 psi., 48.5° gravity.

SOUTH LOUISIANA WILDCAT FAILURES

St. John the Baptist Parish: The Texas Co. 2 Joseph Rathborne Land & Lumber Co., Inc., 2-13s-18e, dry, TD 12,426 ft.

Terrebonne Parish: Kerr-McGee Oil Industries, Inc., and Stanolind Oil & Gas Co. 1 Continental Land & Fur Co., 55-17s-15e, dry, TD 13,027 ft.

Vermilion Parish: Humble Oil & Refining Co. 2 State Lease 1680, Vermilion Bay, 15s-3e, dry, TD 13,001 ft.

Permian Basin

Lower Spraberry Producer Indicated in Reagan County

MIDLAND.—Another producer from the lower Spraberry has been indicated for northwest Reagan County at Sohio Petroleum Co. 1-A Cauble, in 34-36-T5S-T&P, being nearly two sections east of the firm's Leonard Proctor discovery.

A 24-hour flow test on perforations from 7,475-7,505 ft. developed 223.24 bbl. of 40°-gravity oil through ½-in. choke, with gas-oil ratio of 850 cu. ft. Previous to treating the section with Stratafrac, it yielded 10 bbl. of oil an hour by swabbing. At last report the upper Spraberry was to be tested before making completion. Pay section in Sohio 1 Proctor was from 7,565-96 ft. and potential was 645 bbl. of 40°-gravity oil.

On the other side of the county, Atlantic Refining Co. 1-137 J. D. Sugg, had shows of oil in the Wolfcamp. Drill-stem test from 7,549-7,602 ft. developed 90 ft. of clean oil and 210 ft. of oil and gas-cut mud in 1 hour. Drilling continued below 7,655 ft. on an 8,200-ft. contract. Location of the well in NE NE 137-2-T&P is about 1½ miles southwest of nearest production, (Spraberry) and 2¼ miles southwest of Atlantic's Wolfcamp discovery in Section 135.

Reports on development work in the above area include Atlantic 1-111 Sugg, east offset to the Wolfcamp discovery, which was ready to fracture open hole in the Wolfcamp after setting pipe to 8,060 ft.

Atlantic 1-102 Sugg, northeast extension test in Section 102, was drilling in shale at 7,392 ft. York & Harper, Inc., 1-111 Sugg, Section 111, was in sand at 6,917 ft.

In the southeast corner of Irion County, Humble Oil & Refining Co. 1 Mrs. Pearl Williams, Strawn discovery, flowed 150 bbl. of oil in 19 hours, and died, from casing perforations at 7,236-46 ft.

Further testing at The Texas Co. 1 Bubenik, prospective Strawn limestone discovery in Tom Green County, gaged 34 bbl. of oil in 24 hours, with no water. Pay was perforated at 5,440-54 ft. and acidized. Operators were to install pump and run a potential test.

In Glasscock County, Phillips Petroleum Co. 1 Berry, northwest of Garden City, recovered water blanket cut with gas, 900 ft. of gas-cut mud and 115 ft. of distillate on a 2½-hour drill-stem test in the Strawn from 10,525-10,711 ft., total depth. First test, in the top of the Strawn lime at 10,172-90 ft. developed a little gas with no shows of oil. Top of the Strawn at 10,171 ft. was minus 7,527 ft.

In Kent County, Jackson, Douglas & Ritchie 1 Smelser, wildcat 2 miles west of the Salt Creek field, had unloaded 6,200 ft. of fluid while pulling pipe after a 5-hour drill-stem test from 7,070-7,128 ft. The section was believed to be Strawn. Whether or not the fluid was new oil had not been determined. The well had top of the Canyon lime at 6,612 ft., minus 4,516 ft.

According to reports, Gulf Oil Corp. plans to reenter the former Argo Oil Corp. 1 Mitchell Brothers, Presidio County wildcat which was drilled dry to 9,997 ft., in Pennsylvanian shale and sand. Projected new depth was 14,000 ft. to explore the Ellenburger. Location in 40-1-TW&GN is ½ mile west of the Brewster County line and 25 miles southeast of Marfa.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT SUCCESSES

Andrews County: Phillips Petroleum Co. 1-DD University, 22-11-University, TD 8,350 ft., elev. 3,313 ft., Devonian 8,153 ft., pay (3-Bar chert), 8,230 ft., IP 1,465 bbl. 42°-gravity oil, ½-in. choke, GOR 613 cu. ft., TP 825 psi.

Cochran County: Shell Oil Co. 1 Pittman, 1-Y-PSL, TD 11,494 ft., PB 4,853 ft., elev. 3,994 ft., San Andres 3,935 ft., pay 4,193 ft., IP pumped 103 bbl. 24°-gravity oil.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Concho County: Progress Petroleum Co. 1 Fritz Speck, GC&SF 1, A-1,360, dry, TD 3,402 ft., elev. 1,956 ft., Home Creek 2,630 ft., Strawn 3,092 ft.

Dawson County: Texas Crude Co. 1-75 Knight, 75-M-EL&RR, dry, TD 8,944 ft., elev. 3,085 ft., Spraberry 7,550 ft., Dean 8,400 ft., reef 8,924 ft.

Gaines County: J. H. Snowden et al 1-7 Nick Alley, 7-A27-PSL, dry, TD 9,638 ft., elev. 3,448 ft., Clear Fork 6,430 ft., Tubb 6,980 ft., Pennsylvanian 8,770 ft., Mississippian 9,120 ft., Devonian 9,553 ft.

Garza County: Sohio Petroleum Co. 1-A Swenson, 63-2-H&GN, dry, TD 7,512 ft., elev. 2,397 ft., Wolfcamp 4,765 ft., Cisco 5,740 ft., Canyon 6,460 ft., Strawn 7,225 ft., Caddo 7,417 ft.

I. Weiner et al 1 J. M. Shannon, 90-5-H&GN, dry, TD 2,590 ft.

Midland County: Fogelson & Pauley 1 W. C. Houston, 47-36-T1S-T&P, dry, TD 7,450 ft., elev. 2,631 ft., Spraberry 6,979 ft.

Pecos County: The Texas Co. 1 J. M. Montgomery, J. S. Miller Sur. 217, dry, TD 3,400 ft.

Runnels County: Drilling & Exploration Co. 1 Alma Smith, Anderson Sur. 523, dry, TD 4,500 ft.

Humble Oil & Refining Co. 1 J. A. Broadstreet, H. Friley Sur., dry, TD 5,878 ft.

Terry County: Western Natural Gas Co. 1 R. L. Harred, 12-C39-PSL, dry, TD 9,885 ft., Spraberry 7,530 ft., reef 9,683 ft.

Tom Green County: L. E. Scherck 1 C. M. Arrott, Sec. 38, WCRR Sur., dry, TD 6,715 ft., elev. 1,993 ft., Permo-Pennsylvanian 4,441 ft., Strawn 4,779 ft., Ellenburger 5,510 ft.

TEXAS PANHANDLE

AMARILLO.—A total depth of 10,001 ft. has been reached at the Phillips 1 Hobart Ranch, Gray County wildcat, and operations have been started to test the large number of oil and gas shows recovered from formations in all levels of the well. At present the Hobert is at a plug-back total depth of 8,726 ft., though several oil and gas shows were logged below that depth. The first series of perforations, from 8,340-42 ft., have been squeezed, but more perforating is in progress.

More than 30 cores and 20 drill-stem tests were taken in the course of drilling the well to bottom. Best apparent recovery of any drill-stem test was obtained from a 1-hour test at 8,365-86 ft., where an estimated 6 to 10 million cubic feet of gas flowed through drill pipe. Small amounts of free oil was recovered from tests run at 4,692-4,702 ft. and 8,623-40 ft.

Also in the Anadarko basin area, a Sinclair well has showed gas-cut mud recovery on drill-stem test. The 1 Hoover wildcat in Ochiltree County had 1,620 ft. of gas-cut mud on 1-hour test from 7,445-70 ft. The Texas Co. 1 Flowers, successful wildcat in the same county, has been completed for an initial production of 87 bbl. oil per day, plus 19 bbl. water. Pay is from 8,864-79 ft. in the Harbaugh sand topped at 8,858 ft.

A Roberts County wildcat has been announced by The Texas Co. east of Lips field production. The 1 Rogers is to be drilled in Section 160, Block 13, T&NO Survey, 1 mile east of the Sinclair 4 Lips well. Projected depth is 8,950 ft.

The Newton Oil Co. 1 Myers wildcat in Donley County has been abandoned at the Mississippian total depth of 6,510 ft. A small gas show was reported in recovery of a drill-stem test from 3,290-3,354 ft. in Wolfcamp, but no other shows were encountered.

SOUTHEASTERN NEW MEXICO

In eastern Lea County, Amerada Petroleum Corp. 1 Fred Turner, 17-20s-38e, flowed 230 bbl. of new oil through various chokes, then gaged 827 bbl. of 45°-gravity oil in 24 hours, and was moving off rig for completion. Production was from the McKee sand of the Simpson, through perforations between 9,012-88 ft.

The 1 Turner also flowed oil on drill-stem tests from the Simpson at 8,935-9,105 ft., and from the Permian at 7,245-7,410 and 7,536-7,639 ft.

Gulf Oil Corp. announced plans to reenter and test the Pennsylvanian in its 1 Sams-State, 17-15s-33e, which was drilled to the Devonian at 14,126 ft. in 1950. Location is about midway between the Saunders and South Saunders fields of Lea County.

Amerada 1-ECC State, north extension try to the opener of the East Caprock field, had casing set at 11,170 ft. and was running electrical surveys. Total depth was 11,240 ft., in the Devonian.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Lea County: Skelly Oil Co. 1-M Mexico, 9-24s-38e, dry, TD 10,073 ft., elev. 3,236 ft., Mississippian 8,610 ft., Devonian 9,610 ft., Silurian 9,840 ft.

Mississippi

Wilkinson County Oil Discovery Completed

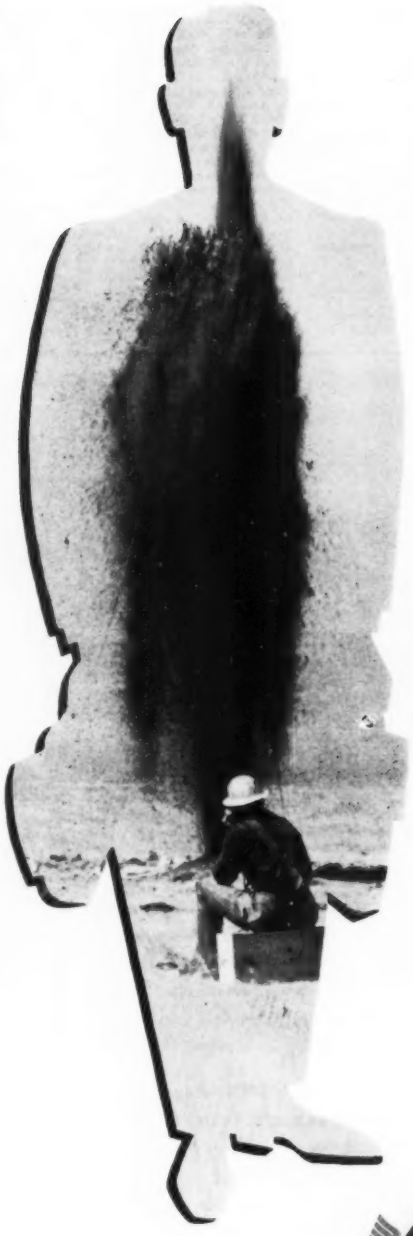
JACKSON.—Final completion has been made at Gulf Refining Co. 1 Crosby Lumber Co., 15-4n-10w, Wilkinson County oil discovery, which is considered one of the best Wilcox producers in the area. From perforations at 6,733-40 ft., the well was completed for 150 bbl. of 38°-gravity oil daily through ⅛-in. choke. Tubing pressure registered 555 psi. Hole was drilled to total depth of 6,955 ft. and casing was run to 6,979 ft. The name "Ireland" has been adopted for the field.

Lion Oil Co. 2 Denkmann, 22-7n-4e, Smackover test in Rankin County, has drilled out cement to bottom of hole at 15,140 ft. after setting 7-in. casing at 15,090 ft. Operator conducted 1 hour and 45-minute drill-stem test of open hole below casing. Top pressure throughout the test was ½ psi. and recovery was an unestimated amount of nonflammable gas and some drilling mud. Bottom-hole pressure was 5,100 psi. flowing and 9,700 psi. shut in. At last report, preparations were being made to core ahead with diamond coring equipment.

West Lincoln field has been extended approximately 1 mile to the northwest at Roeser & Pendleton, Inc., 1-A Board of Supervisors, SE SE 16-6n-6e, Lincoln County. Cores and electric log indicate saturated sand with excellent permeability at 10,620-32 ft. in the Lower Tuscaloosa. Casing is being run prior to testing the sand.

Humble Oil & Refining Co. is coring at 1 H. C. Spears, 27-1n-6e, Amite County wildcat after setting 7-in. casing at 11,313 ft.

In Wayne County, Gulf Refining 1 H. A. Chapman, Sr., "A," 19-10n-6w, is bottomed



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at 13,941 ft. and operator has set whipstock at 12,706 ft. and is preparing to sidetrack.

MISSISSIPPI WILDCAT SUCCESS

Wilkinson County: Oil discovery, "Ireland" —Gulf Refining Co. 1 Crosby Lumber & Mfg. Co., 15-4n-1w, TD 6,952 ft., Wilcox 6,733-40 ft., IP 151 bbl. oil per day, 38° gravity, ¼-in. choke, TP 555 psi.

MISSISSIPPI WILDCAT FAILURES

Adams County: Humble Oil & Refining Co. B-1 James S. Giles et al, 4-7n-3w, dry, TD 6,506 ft.

B. Serio 1 Mrs. Martha Bailey, 47-6n-2w, dry, TD 6,890 ft.

Franklin County: F. H. Shortridge 1 U.S.A., 11-5n-2e, dry, TD 7,006 ft.

Wilkinson County: Gulf Refining Co. 1 Nathan McGee, 31-3n-4w, dry, TD 8,005 ft.

ALABAMA WILDCAT FAILURES

Mobine County: Justiss-Mears-Morgan-Borden 1 E. L. Hatter, 29-1s-1w, dry, TD 8,015 ft.

Washington County: Justiss-Mears Oil Co. 1 J. M. Pelham, Jr., 14-5n-3w, dry, TD 7,024 ft.

Canadian Fields

Saskatchewan Discovery Brings Bright Prospects

CALGARY.—The New Year has so far brought bright prospects for a beneficial year in western Canada's oil industry. With less than a week gone by in January, a significant oil discovery in Saskatchewan has added further incentive to oil operators that are exploring in that province. In Alberta, a well that discovered "wet gas" late last year has continued to penetrate a highly prolific distillate-bearing natural-gas zone which will likely class it among Canada's largest wet gassers. Also in Alberta, two extension ventures in the young Drumheller Devonian oil area were assured of commercial oil production.

The highest grade of crude oil so far found in Saskatchewan was discovered this week in the southwest sector of that province, in the Roseray area about 28 miles northwest of Swift Current. This medium-light crude oil strike at Roseray is located about 350 miles west of the most easterly light oil so far found on the prairie provinces. That east oil discovery was made at Virden, Manitoba, in 1951. Further encouragement has now been added for prospecting between this 350-mile east-west stretch. Light-oil discoveries south of the international border that were made in North Dakota and Montana last year, also added hopes for productivity on the Canadian side of this region.

The new Saskatchewan find was made in the Lower Cretaceous at Socony-Western 1 Prairie-Roseray, on LSD 2, 10-17-18w3. Two drill-stem tests have so far been run at the discovery well, indicating that 30 ft. of water-free pay zone have so far been penetrated. Latest test, from 3,095 to 3,105 ft., gave an oil recovery of 1,240 ft., no water, in 20 minutes. The discovery test, from 3,070 to 3,100 ft., gave up 3,070 ft. of clean oil in 30 minutes. It is believed that both tests would have flowed to the surface had valve been opened for a longer period. However, storage tanks were not installed, so tests were kept to short duration. Tanks are now at wellsite, and if well will flow during weekend tests a flow test may be run. A gravity check has been run on the Roseray oil, and it is rated at 24° A.P.I. Socony-Vacuum Exploration Co., who is drilling the well on farmout acreage acquired from Western Prairie Exploration Co., plan to continue coring and testing at 10-ft. intervals.

Coring and testing operations at the Texaco-McColl team's Bonnie Glen wet gas discovery well continues to give up further pay zone, with nearly 400 ft. of gas cap so far opened at this well. An increasing volume of natural gas, plus distillate resulted from tests in this D3 Devonian gas zone. Gas flow rates have reacher over 10½ million cubic feet daily, while the distillate volume accompanying that flow has not been specified. At bottom 6,779 ft., Texaco A-1 Bonnie Glen has opened up 397 ft. of gas cap and crew was continuing coring and testing operations in an effort to fully penetrate the gas zone and in hopes of finding an oil column below the gas cap. The well is located on LSD 3, 20-47-27w4, about 6½ miles south of Wizard Lake D3 Devonian oil wells.

Great Plains Development Co. of Canada and the Western Leaseholds-Dome-Naco team each found D2 oil at their extension ventures in the Drumheller area of southern Alberta during the first few days of January. The pair of new oil wells boost to four the number of Drumheller wells that are capable of producing D2 Devonian oil. An additonal three Lower Cretaceous oil wells are located about ½ mile north of Devonian production. Great Plains' new extension success, the first Drumheller producer for that company, is about ½ mile northeast of a previously drilled oil well, and flowed D2 oil during drill-stem test. The Western-Dome-Naco producer is a 1-mile west step-out from that team's D2 oil discovery well, and is located on LSD 14, 25-29-20w4. This is the team's sixth oil well in the Drumheller area which is located some 65 miles northeast of Calgary.

CANADIAN WILDCAT FAILURES

Sun 1 Bede Creek, LSD 3, 32-107-22w5, TD 5,437 ft.

Seaboard-Imperial-Amglo 1 Buffalo Lake, LSD 9, 11-42-21w4, TD 5,964 ft

Delhi-Socony 1 Bullpound, LSD 7, 27-24-15w4, TD 3,850 ft.

A. P. Con.-Socony-Warner 1 Drumheller, LSD 4, 10-29-18w4, TD 5,680 ft.

Rocky Mountain

Wyoming Deep Test Heads For Nugget Sand

DENVER.—Pure Oil Co. is now coring below 16,397 ft. at the West Poison Spider, Wyoming deep test, with the well headed for Nugget sand. The well is 3 Unit, SW NW SE 10-33n-84w, a deepening from the Mesaverde at 10,128 ft. This well found saturation in cores of the Lakota sand at around 16,000 ft. and casing was cemented at 16,071 ft. before the operator started coring ahead for Nugget, expected at around 16,800 ft.

This wildcat is of considerable interest for deeper drilling in the Basins of the Rocky Mountains. Pure completed the discovery in this field in 1949, with the well producing from Frontier at around 14,000 ft. A subsequent discovery was made by Pure in the second well in the Mesaverde, but neither have produced substantial amounts of oil.

Husky Oil Co.-Wilshire Oil Co. have cemented casing at 11,940 ft. at the apparent Phosphoria deep discovery in the Big Horn Basin. Well 1 Torgeson, C NE NE 29-49n-93w, in the Five Mile area, topped Phosphoria at 11,645 ft. and found an estimated 5 to 10 million cubic feet of gas with some distillate on tests of the formation. The operators will drill ahead for Tensleep prior to further tests of the Phosphoria zone. This well is northwest of the Worland field where oil is produced from the Phosphoria and Frontier formations. Southwest of Worland Gulf Oil Corp. is recementing intermediate casing after finding some oil and gas in the Frontier formation at around 9,100 ft. Gulf will drill ahead for the Phosphoria and possibly Tensleep before completion of the well. Both wells are located on seismic highs in the deep portion of the Big Horn Basin.

The Texas Co. has officially completed its Devonian (?) discovery at 1 Northern Pacific, C NE NE 35-15n-54e, Dawson County, Montana, for a gage of 254 bbl. of oil daily. The well is flowing by heads, and testing will continue. This is the second discovery in the past 3 weeks for the Montana portion of the Williston Basin. The well was drilled to 9,079 ft., with top of saturation at 8,745 ft. and Devonian topped at 8,542 ft. Definite correlation for the producing zone has not been announced by Texas and cores are now being studied to properly identify the producing zone. The well is south of the recent Shell Oil Co. Charles (Mississippian) formation discovery and northwest of Shell's Pine Unit discovery, where pump is now being installed.

A near-completion for 1951 is the Stanolind Oil & Gas Co.-Continental Oil Co. Tensleep producer at North Fork, northwest of the Sussex field. This well flowed 173 bbl. of oil in 24 hours through 2-in. choke for an initial on December 31. The well is 1 Government-Mains, C SW SW 19-44n-81w, and the producing zone is between 6,484-6,680 ft. The oil is 21° gravity, as compared with 30°-gravity oil produced from Tensleep at Sussex. This week Continental found oil in the first deep test in the Meadow Creek field, with the well making 5,500 ft. of oil on 1-hour test of the zone 8,986-9,056 ft. The well is 98 Unit, SE NE NW 11-41n-78w, 5 miles southeast of the closest Tensleep producer at Sussex field. Continental has cored to 9,109 ft. and is now making a second test on this well.

Another apparent Tensleep discovery is now being tested by Harold Barnes, Bruce Anderson and R. L. Peterson of Casper at their North Casper Creek wildcat. The well, 1 Government, NE NW SE 1-36n-82w, flowed 175 bbl. of oil in 24 hours from Tensleep between 3,206-3,243 ft. This wildcat is south of the general Salt Creek area and also south of any previous Tensleep production along the southwest side of the Powder River Basin. Tensleep has not furnished a large reserve for this portion of Wyoming, although productive at Salt Creek, and a heavy producer in other parts of the state. With the current series of Tensleep discoveries a number of pools may now be drilled deeper, although the formation was dry at Big Muddy and other proven fields in the area.

COLORADO WILDCAT SUCCESS

Logan County, Hoover: H. C. Arnold et al 1 Hoover, NE NE SW 3-7n-54w, pumped 62 bbl. oil per day, TD 5,038 ft., Greenhorn 4,668 ft., Graneros 4,675 ft., "D" sand 4,825 ft., "J" sand 4,914 ft.

COLORADO WILDCAT FAILURES

Morgan County: British-American 1 Hope Bishop, NE SE SW 18-5n-58w, dry, TD 6,505 ft., Niobrara 5,426 ft., Carlile 5,745 ft., Greenhorn 5,948 ft., "D" sand 6,134 ft., "J" sand 6,207 ft., Lakota 6,490 ft.

WYOMING WILDCAT FAILURES

Big Horn County, Coon Creek Unit: Stanolind Oil & Gas Co. 1 Pepper, NW NW NE 26-55n-97w, dry, TD 8,450 ft.

Zeisman Dome: C. Cole et al 1 Government, NW NW NE 29-49n-89w, standing, TD 900 ft.

Campbell County, Adon: The Texas Co. 4 Unit, NW SE SW 14-53n-72w, dry, TD 9,714 ft., Sundance 7,855 ft., Spearfish 8,165 ft., Minnekahata 8,747 ft., Minnelusa 8,807 ft.

Converse County, East Cole Creek: Sinclair Oil & Gas Co. 1 Smith, Marvin, SE SE NE 23-35n-77w, dry, TD 9,050 ft., second Wall Creek 8,056 ft., Muddy 8,800 ft., Dakota 8,943 ft., Lakota 9,017 ft.

Fremont County, Castle Garden: Sinclair Oil & Gas Co. 2 Castle Garden, NE SW NW 24-34n-91w, dry, TD 3,300 ft., Shannon 3,072 ft.

Natrona County, East Notches: Me. E. Davis 1 Government, S NW SW 17-37n-84w, dry, TD 4,218 ft., Sundance 2,552 ft., Alcova 3,040 ft., Embar 3,725 ft., Tensleep 4,143 ft.

UTAH WILDCAT FAILURE

Uintah County, Oil Springs: Continental Oil Co. 1 Unit, SE SW SE 15-12s-24e, dry, TD 4,340 ft., Wasatch 2,142 ft., Mesaverde 3,087 ft.

NEBRASKA WILDCAT FAILURES

Box Butte County: Service Drilling Co. 1 Brown-Sturgeon, C SW SW 1-24n-49w, dry, TD 3,684 ft., Skull Creek 3,298 ft., Dakota 3,422 ft., Morrison 3,650 ft.

Cheyenne County: Jack Wise 1 Miller, NE NE SW 34-16n-52w, dry, TD 5,767 ft.

S. E. Reimers: Westbury Petroleum Co. 1 Schultz, NE NE SE 26-16n-50w, dry, TD 4,957 ft.

R. L. Carruthers 1 Schnell, NE SE SW 25-14n-49w, dry, TD 4,530 ft.

Kimball County: S. D. Johnson 1 Doug Johnson, SW SW SW 2-13n-58w, dry, TD 7,506 ft.

Scottsbluff County, Stegall area: Steele Oil Co. 1 Joe Long, SW SW SE 8-22n-57w, dry, TD 6,090 ft., Dakota 5,824 ft., Lakota 6,060 ft.

Sioux County, North Mitchell: Albert Lecleric and E. Laucomer et al 1, SE NE NW 22-24n-56w, dry, TD 5,272 ft., Codell 4,470 ft., "D" sand 5,052 ft., "J" sand 5,242 ft.

SOUTH DAKOTA WILDCAT FAILURE

Butte County, Bell Fourche River area: P. R. Harmon 1 William Olson, NW NE NE 27-9n-3e, shut down, TD 3,250 ft., Dakota 800 ft., Minnelusa 2,360 ft., Greenhorn 3,060 ft.

NORTH DAKOTA WILDCAT FAILURE

Emmons County, Linton: T & O Oil 1 Ohlhauser, C NE SE 6-132n-78w, dry, TD 5,882 ft., Winnepeg sand 5,539 ft., Cambrian 5,685 ft., pre-Cambrian 5,875 ft., granite 5,881 ft.

WESTERN NEBRASKA WILDCAT SUCCESS

Kimball County, Enders: Twin Oil & Rock Hill 1 Enders, NE NW SE 15-13n-55w, flowed 40 bbl. of oil per hour, TD 6,354 ft., Niobrara 5,345 ft., Greenhorn 5,896 ft., "D" sand 6,194 ft., "J" sand 6,302 ft.

MONTANA WILDCAT FAILURES

Blaine County, Cherry Ridge: Montana-Canadian 1 Thompson, C SW NW 2-34n-22e, dry, TD 5,267 ft., Sawtooth 4,850 ft.

Carbon County, Blue Water area: Deep Rock 1 Rukavine, SW SW NE 3-6s-24e, dry, TD 1,464 ft., Madison 1,048 ft.

Chouteau County, Little Sandy Structure: Homestake Oil & Utah-Southern 1 Kruist, C NE NE 2-27n-13e, dry, TD 920 ft.

Hill County, Boxelder Dome: Montana Gas Corp. 1 Travis, SW SW SW 10-32n-17e, dry, TD 1,346 ft.

Park County, Livingstone area: Snyder et al 1 Burgess-Preston, NW NW SE 28-2s-11e, standing, TD 917 ft.

Toole County, NE Cut Bank area: Buckley & Associates 1 Buckley, C SW SE 15-37n-4w, dry, TD 2,727 ft.

Louisiana-Arkansas

Open Smackover Lime Oil Pool in Union County

SHREVEPORT.—Marine Oil Co. last week discovered a new low-gravity oil field from the Smackover limestone 1½ miles northwest of North New London field, Union County, South-Central Arkansas.

Their 1 Pine, C NE SE 30-17s-12w, pumped 156 bbl. of 16°-gravity oil per day with no water following casing perforations from 6,046-60 ft. in Smackover limestone topped at 6,043 ft. Originally, the wildcat was drilled to a total depth of 6,297 ft. and pipe cemented at 6,136 ft.

Alcan Oil Co., Shreveport, last week was preparing to take potential on a new Meek-in sand oil discovery in Calhoun County, South-Central Arkansas. Their 1 Freeman-Smith Lumber Co., 480 ft. from north line, 990 ft. from east line SE 17-15s-13w, pumped 25 bbl. of 16°-gravity oil plus 1.2 per cent water. Production was through casing perforations from 2,561-76 ft. The well was drilled to 2,580 ft., total depth, and the 7-in. pipe cemented on bottom.

Louisiana.—Atlantic Refining Co. may set pipe on a wildcat 5 miles southeast of Holly Ridge field in Tensas Parish, North Louisiana. Last week, their 1 H. T. Goldman, 1947 ft. from south line, 2,010 ft. from west line 12-10n-10e, cored from 8,917-37 ft., and recovered 20 ft. of sand with spotted fluorescence in top and solid fluorescence through rest of sand with good taste and odor throughout. A 20-minute drill-stem test was conducted on this section from 8,916-37 ft.; using ¼-in. top and bottom chokes, and a 2,000-ft. water cushion, recovery was water cushion and 200 ft. of 43°-gravity oil, 100 ft. of gas-cut mud and no salt water. Bottom-hole flowing pressure was 3,355 psig. and bottom-hole shut-in pressure was 3,940 psig. Prospective pay is the basal Tuscaloosa sand.

LOUISIANA WILDCAT FAILURES

Madison Parish: O. G. Collins et al 1 N. E. McElwee, 3,206 ft. N and 3,264 ft. W SEc 37-15n-9e, dry, TD 5,309 ft.

Morehouse Parish: Vernon Whitely Drilling Co. 1 Ober, 2,440 ft. E and 660 ft. S NWc 16-23n-8e, dry, TD 3,274 ft.

Sabine Parish: Carter 3 Louisiana Long Leaf Lumber Co., 100 ft. N and 691 ft. E SWc NW SE 32-7n-12w, dry, TD 1,700 ft.

Winn Parish: Natural Gas & Oil Corp. 8 Urania Lumber Co., 700 ft. N and 615 ft. W SEc 32-11n-1e, dry, TD 3,508 ft.

ARKANSAS WILDCAT SUCCESSES

Calhoun County: Alcan Oil Co. 1 Freeman-Smith Lumber Co. "A," 480 ft. S and 990 ft. W NEc SE¼ 17-15s-13w, pumped 25 bbl. 16°-gravity oil at 2,561-76 ft. from Meakin sand TD 2,580 ft.

Union County: Marine Oil Co. 1 Pine, C

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4-WHEEL-DRIVE WILLYS STATION WAGON

NE SE 30-17s-12w, pumped and flowed 175 bbl. 16°-gravity oil at 6,046-60 ft. from Smackover, TD 6,297 ft.

ARKANSAS WILDCAT FAILURES

Columbia County: Lion Oil Co. 1 Franks, C NW SE NW 28-18s-21w, dry, TD 3,434 ft.

Union County: Lawton Oil Corp. 3 Union Sawmill Co. "B," C SW SW 35-18s-14w, dry, TD 2,897 ft.

Kansas

Osborne County Gets First Oil Production

OSBORNE County appears to be getting its first oil production where Anderson-Prichard Oil Corp. is testing its 1-A Ruggles, NW NW NW 23-10-15. First tests have been in a sandy conglomerate zone, topped at 3,383 ft. (—1,520 ft.). With casing perforated at 3,390-3,410 ft., the well swabbed at an average rate of 8½ bbl. of oil per hour. The well also is a potential producer in the Lansing-Kansas City lime section, in which promising showings were encountered in a series of drill-stem tests made during the course of drilling. Top of the Lansing was logged at 3,019 ft. (—1,151 ft.). Arbuckle lime, topped at 3,489 ft., and in which hole was carried to 3,557 ft., failed to produce, and hole, with casing to 3,500 ft., wis plugged back to 3,445 ft. for present tests.

Location of the well is in the southwest corner of the county. Nearest other production is 5 miles to the southwest in the Fairport pool, northwestern Russell County.

Deep Rock Oil Corp. is continuing tests at its 1 Horner, C NW NW 29-33-26, a wildcat northwest of the McKinney gas area in southeastern Meade County, southwestern Kansas, following a brief blowout. The well got out of control while installing blowout preventer equipment after a preliminary test in the Mississippian in which it flowed at an estimated rate of 10,000,000 cu. ft. of gas daily. The well was closed after blowing out of control 40 minutes. Hole had been drilled to a total depth of 7,731 ft. in Arbuckle lime, which was found dry, and casing run to 5,935 ft. Casing was perforated in Mississippian lime, topped at 5,723 ft.

A ¾-mile westward extension is indicated for the Evers pool, in Pawnee County, where Iron Drilling Co. recovered 3,510 ft. of clean oil in a drill-stem test of Simpson sand at its 1 Prosser, SW SW SW 36-21-16. Top of the Simpson was checked at 3,843 ft. (—1,859 ft.). The test, with tool open 45 minutes, was made of an interval at 3,849-85 ft. Since then hole has been carried to the Arbuckle lime, topped at 3,906 ft. and drilled to 3,917 ft., where first tests will be made. Casing is bottomed at the top of the latter zone.

Stanolind Oil & Gas Co. is opening a new Simpson sand producing area in Stafford County, where its 1 Taylor, NE NE NW 15-21-14, swabbed at the rate of 5 bbl. of oil per hour while testing with casing perforated at 3,682-88 ft. Top of the Simpson is at 3,646 ft. (—1,717 ft.). The well previously tested water in Arbuckle lime at a total depth of 3,741 ft. Location is about a mile northeast of the Bayer pool.

Petroleum, Inc., has run casing to test promising oil showings encountered in the Lansing-Kansas City lime section at its 1-D Keenan, SW NE NW 36-21-14, a mile south of production of the Southwest Pundsack pool, also in Stafford County. First Lansing was logged at 3,413 ft. (—1,481 ft.). A series of drill-stem tests was made through the section, getting varied recoveries of oil-cut mud. Hole was drilled to 3,826 ft. in Arbuckle, topped at 3,786 ft., and in which casing was run to 3,807 ft.

Anderson-Prichard Oil Corp. 1 Arnold, NW NW NW 17-15-16, southeastern Ellis County, wildcat, tested water in Arbuckle lime and bailed 5 gal. of oil per hour in early tests of the shallower conglomerate zone, in which a drill-stem test had given indications of possible production. Arbuckle lime, topped at 3,512 ft. (—1,584 ft.), was tested at a total depth of 3,523 ft. with hole open from 3,514 ft. The conglomerate zone, topped at 3,465 ft., is open through casing perforations at 3,465-72 ft. The drill-stem test of that zone yielded 40 ft. of oil and 40 ft. of mud-cut oil. Location of the well is about 5 miles northwest of the Beeching pool, nearest production.

KANSAS SUCCESSFUL WILDCATS

Gove County: Musgrove Petroleum Co. 1 Teeter, NE NE SE 26-13s-30w, pumped 374 bbl. of oil at 4,547-50 ft. from Mississippian, TD 4,725 ft.

Graham County: Yockey Oil Co. 2 Walker, NW SE NW 34-9s-22w, pumped 50 bbl. of oil at 3,155-85 ft. from Lansing, TD 3,807 ft.

Rush County: Kelinson et al 1 Pfeifer, NW NW NW 6-16s-17w, pumped 160 bbl. of oil at 3,342-46 ft. from Lansing, TD 3,512 ft.

KANSAS WILDCAT FAILURES

Barber County: Skelly 1 Boggs "E," NW NW SW 2-33s-12w, dry, TD 4,990 ft.

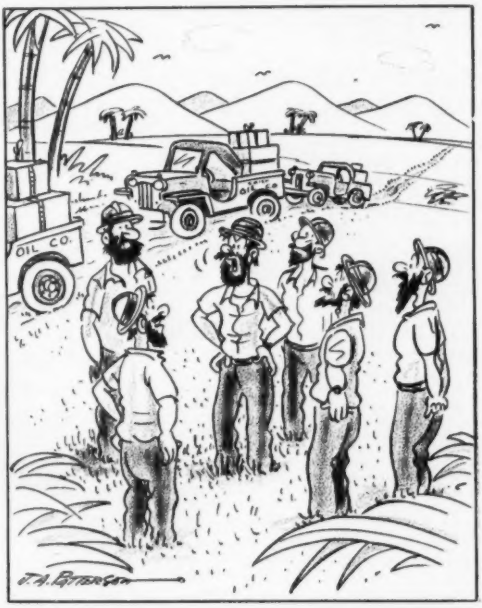
Barton County: Victor Drilling Co. 1 Moses, NE SE SE 13-20s-14w, dry, TD 3,595 ft.

Butler County: National Associated Petroleum Co. 1 Buckman, NE NE NW 11-25s-7e, dry, TD 3,216 ft.

Palmer Oil Co. 1 Allen, SE SW NW 23-26s-6e, dry, TD 3,205 ft.

Ellsworth County: B&R Drilling Co. 1 Stoltenberg "B," SW SE SE 19-16s-10w, dry, TD 8,435 ft.

Graham County: Heathman & Co. 1



THE OIL AND GAS JOURNAL

"There's something haywire here—yesterday there were only five of us!"

Schultz, SE SE SW 27-10s-23w, dry, TD 4,173 ft.

Harvey County: Don Ingling 1 Hill, NW NE NE 23-24s-2e, dry, TD 3,378 ft.

Lane County: Continental Oil Co. 1 Armantrout, SW SW SW 21-18s-30w, dry, TD 5,152 ft.

McPherson County: National Associated Petroleum Co. 1 Swanson, NE NE SE 8-19s-2w, dry, TD 3,620 ft.

Ness County: Rycade Oil and Federal Royalty 1 Solize, NW NW SE 28-17s-26w, dry, TD 4,425 ft.

Norton County: Cities Service et al 1 Fredde, NE NE NE 8-5s-22w, dry, TD 3,620 ft.

Phillips County: National Associated Petroleum Co. 1 Emerick, NE SW NW 10-4s-18w, dry, TD 3,599 ft.

Pottawatomie County: H. E. Sloan 1 Brown, SW SW NW 34-9s-12e, dry, TD 3,350 ft.

Rooks County: Barnett Oil Co. 1 Nichol, SE SE SW 7-6s-20w, dry, TD 3,761 ft.

K&E Drilling Co. 1 Kollman, NW NW NW 17-8s-16w, dry, TD 3,342 ft.

Russell County: Elreco and Aylward 1 Kaufman, SW SW NE 19-15s-12w, dry, TD 3,367 ft.

Saline County: National Associated Petroleum Co. 1 Nelson, SW SE SW 22-16s-3w, dry, TD 3,572 ft.

Sedgwick County: J. P. Gaty 1 Shorehose, NE SE NE 1-25s-1e, dry, TD 2,998 ft.

Stafford County: Buick Drilling Co. 1 Olmstead, NE NE SE 16-21s-12w, dry, TD 3,650 ft.

Jackson Drilling Co. 1 Miller, NE SE NW 23-23s-14w, dry, TD 4,047 ft.

Thomas County: National Associated Petroleum Co. 1 Ostermeyer, SE SE SE 1-10s-31w, dry, TD 4,907 ft.

Trego County: Aurora Gasoline 1 Osborne-Monroe, NE NE NW 7-11s-21w, dry, TD 3,818 ft.

Aurora Gasoline 1 Baird, SE SE SW 21-11s-23w, dry, TD 4,280 ft.

Oklahoma

Second Well Started in New Beaver County Pool

LOCATION has been made for the first confirmation test for the new pool being opened by Flynn Oil Co. 2 miles north of Beaver, in Beaver County, Oklahoma Panhandle. It was staked by Cities Service Co. on its Miles lease, offsetting the Flynn discovery well, 1 School Land, SE SE SE 35-5n-23eCM, to the east in the SW SW SW 36.

In the meantime, pumping tests at the Flynn discovery well have been delayed pending availability of lease storage space. Pumping equipment has been installed since swabbing tests several weeks ago in which the well produced at rates up to 20 bbl. of oil per hour from a soft lime formation at 5,544-54 ft.

Pure Oil Co. is continuing tests of various prospective productive zones encountered in its 1 Akert, another Beaver County wildcat located 3 miles northwest of Knowles in the SE SE SW 16-5n-26eCM. After finding water in the Arbuckle lime, topped at 9,040 ft., and drilled to 9,240 ft., hole was plugged back first to 8,940 ft. for a test of the Simpson. With casing perforated at 8,885-8,940 ft., it filled 3,070 ft. of fluid in a 60-minute drill-stem test. Fluid included 1,000 ft. of water cushion, 360 ft. of mud, and 1,710 ft. of salt water. Since then, hole has been plugged to 8,780 ft. for tests of Viola lime.

First offset to the new Springer sand discovery well being completed by Stanolind Oil & Gas Co. 2 miles northeast of Gotebo, northern Kiowa County, in the southwestern part of the state, has been staked by Gulf Oil Corp. It is 1 Voyles heirs, SE NW NE 2-7n-16w, a 40-acre location northeast of the Stanolind producer, 1 Kennedy, SE NE NW 2-7n-16w. The latter well is producing from casing perforations at 5,082-92 ft., 5,072-78 ft., and 5,050-68 ft. in Springer sand, topped at 4,923 ft. During a late test, it swabbed and flowed 184 bbl. in 24 hours. Hole is plugged back to 5,138 ft. after having been drilled to 10,044 ft. No important shows were found below the Springer.

A. O. Olson has a new Bartlesville sand discovery on the east flank of the Happy Valley pool in Lincoln County, where his 1-A Deacon, NE NW SE 30-17n-6e, flowed 7 bbl. of 40°-gravity oil per hour while cleaning out. Pay is in open hole at 3,299-3,316 ft.

A deeper pay zone, the second Dutcher sand, apparently has been uncovered in the old Haydenville pool, northern Okfuskee County, reviving development in that area. Previous production in the area has been from the first Dutcher sand. The new discovery well, Frank B. Murta 1 Raybourne, NW NW NW 27-13n-10e, located east of the old production, missed that pay but found good saturation in the lower zone at 2,820-32 ft. During a drill-stem test of that interval, it flowed at an estimated rate of 40 bbl. per hour with oil at the surface in 5 minutes after the tester was opened. Casing has been run to the top of the pay. Rig already has been moved to a north offset location at 1 Martin, SW SW SW 22.

Sinclair Oil & Gas Co. has completed its 1 Evans, NE SE SW 34-8s-2e, southern Love County, just across the Red River from the new field opened by this company in Cooke County, Texas. The well swabbed and flowed 75 bbl. of oil with 105,000 cu. ft. of gas per day. Pay zone is the Hudspeth sand, opposite which casing is perforated at 4,190-98 ft. The discovery well, on the Texas side of the line, produces from a sand at 3,692-3,706 ft.

OKLAHOMA WILDCAT SUCCESS

Kiowa County: Stanolind 1 Kennedy, SE NE NW 2-7n-16w, perforated 5,085-92 ft., flowed 160 bbl. 27°-gravity oil in 6 hours, perforated 5,050-68 ft. and 5,072-78 ft., swabbed 230 bbl. of oil in 7 hours, swabbed 17 bbl. of oil per hour for last 3 hours, top Springer pay 4,823 ft., swabbed 273.50 bbl. of oil in 24 hours, TD 5,200 ft., PBTD 5,138 ft.

"—and if you'll just sign this lease you can loaf for the rest of your life!"

OKLAHOMA WILDCAT FAILURES

McIntosh County: Mead Production 1 McIntosh, NE NW SW 1-12n-15e, dry, TD 2,357 ft.

Okfuskee County: Woods Oil & Gas Co. 1 Adams, SW SW SE 2-12n-7e, dry, TD 4,512 ft.

Oklahoma Copnty: Mid-Continent 1 Sasser, SE SE SW 29-14n-1e, dry, TD 5,785 ft.

Seminole County: Globe Oil Co. 1 Pollard, NE SE NE 16-9n-8e, dry, TD 3,664 ft.

Stephens County: C. V. Richardson 1 Crews, SE SE NW 2-1s-8w, dry, TD 5,006 ft.

Texas Gulf Coast

Lavaca County Strike Pays Rich Gas-Distilate

HOUSTON.—Cities Service Oil Co. apparently has a very rich gas-distillate strike in Lavaca County 4 miles west of Sublime field. The firm's 1 D. I. Underwood is flowing at the rate of 1,000,000 cu. ft. of gas per day through ¼-in. choke plus 75 bbl. of 53.6°-gravity distillate per million cubic feet. Production is from perforations at 9,685-90 ft.

M. E. Andrews is preparing to test 1 Louis Hoff, wildcat 5 miles east of Goliad in Goliad County. Hole was drilled to 4,223 ft. and operator set 5½-in. production string on bottom. Electric log was run to 4,200 ft., and operator is reportedly moving in completion rig to test around 3,200 ft. which had an indicated oil sand.

Also in Goliad County, O. Neathery, Jr., is reported to have a gas-distillate discovery at 1 O. G. Drier, wildcat in the old Maetze area. On drill-stem test at 5,561-64 ft., fluid was to the surface in 13 minutes and well showed working pressure at the surface of 1,125 psi. Recovery was gas-cut salt water with bottom-hole flowing pressure of 3,650 psi. Operator squeezed these perforations and will attempt completion through perforations at 5,537-42 ft.

Humble Oil & Refining Co. has completed an excellent oiler on the flank of Danbury Dome field, Brazoria County, at E-8 Bassett Blakely. On potential test, the well flowed 755 bbl. of 39.9°-gravity oil daily through ¼-in. choke. Production is through perforations at 5,634-60 ft.

A gas-distillate discovery is indicated in San Jacinto County at Stanolind Oil & Gas Co. 1 Emily Langham. On drill-stem test of perforations at 10,201-08 ft., the well flowed 2.9 bbl. of distillate in an hour, and flowed gas at the rate of 1,550,000 cu. ft. per day. Flowing pressure was 3,175 psi. Location of the new discovery is in S. S. Lanier Survey, Abstract 200.

Magnolia Petroleum Co. 1 Gracey-Wegenhoft, Colorado County wildcat, had gas kick while coring at 11,642 ft. and crews were forced to condition mud. Coring is now at 11,646 ft. Core from 11,627-42 ft. recovered 12 ft. of sand with no shows. Earlier gas kick was reported at 11,225 ft. and a hard sand with gas odor was cored from 11,386-95 ft. This venture has a proposed depth of 14,000 ft.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT SUCCESSES

Bee County: Gas-condensate discovery—W. W. Carter 1 T. W. Robertson, J. W. Morrow Sur., TD 8,818 ft., Mackhank 8,456-63 ft., IP: 41,000,000 cu. ft. of gas plus 27 bbl. distillate per million cubic feet, SIP 2,894 psi.

Gas-condensate discovery—Stanolind Oil & Gas Co. 1 C. G. Friedrich, J. E. McIver Sur., TD 9,020 ft., Slick-Wilcox 7,436-50 ft., IP: 47 bbl. distillate and 3,728,000 cu. ft. of gas daily, 50° gravity.

Goliad County: Gas discovery—Magnolia Petroleum Co. 1 Bill Rodgers, W. P. Miller Grant, A-193, TD 3,500 ft., perf. 3,205-15 ft., IP: 1,450,000 cu. ft. of gas daily.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

DeWitt County: Arkansas Fuel Oil Co. 1 G. H. Kuester, SA&MG RR Sur., Sec. 5, A-441, dry, TD 9,002 ft.

Harris County: Hastings Oil Co. 1 Francis Tesor, Reels & Trobough Sur., dry, TD 6,869 ft.

Jackson County: J. M. Huber Corp. 3 L. B. Hollingsworth, Eli Mercer Sur., A-54, dry, TD 4,612 ft.

Jasper County: Ginther, Warren & Ginther 1 Temple Lumber Co., A. Montgomery Sur., A1371, dry, TD 8,062 ft.

Tyler County: Humble Oil & Refining Co. 1 C. L. Dickerson, John Nowlin Sur., A-486, dry, TD 7,996 ft.

Wharton County: Guy F. Stovall 1 Conner & Raun, WCRR Sur., Ses. 25, A-361, dry, TD 5,531 ft.

Central Area

ILLINOIS

Carter Oil Co. has a prospective new discovery at its 2 C. H. Carroll, NE SW NW 19-4s-13w, White County, where casing has been run to test good saturation found in Clore sand (member of the Chester series). Pay was logged at 1,867-73 ft. Bottom of the casing run with an alloy section opposite the pay interval, is 1,923 ft. A 2-hour drill-stem of the interval had 120 ft. of gas, 570 ft. of clean oil and 60 ft. of heavily oil-cut mud in the pipe. No water was indicated. Hole was drilled to 3,071 ft. but no additional showings of commercial value were found in the lower horizons.

Location of the well is 3 miles northeast of New Harmony, Ind., on Bull Island in the Wabash River, county and state boundary. More than a mile from other production, the well is the first on this island.

George & Wrather have completed another good well, the third in their newly opened pool 5 miles southwest of Flora, in northern Wayne County. It is their 3-B Dwight McGrew, NE SW NE 21-2n-6e, a location northeast of their second well, 1-B McGrew, and two locations northeast of their discovery well, 1 McGrew.

The new well, producing from Rosiclare lime, one of two pay zones of the discovery well, flowed 50 bbl. per hour initially and made 869 bbl. in the first 24 hours. Pay interval, where casing was perforated, is at 3,090-96 ft. Broken saturation was logged from 3,078 to 3,100 ft. in Rosiclare, as well as from 3,130 ft. to 3,151 ft. in McClosky lime. Total depth is 3,189 ft. The operators' second well, 1-B McGrew, produces from McClosky lime at 3,143-48 ft., from which it pumped 120 bbl. per day at completion. The discovery well produces from both zones.

WESTERN KENTUCKY

Additional importance is being attached to the area 6 miles southeast of Sebree in the eastern tip of Webster County as the result of the discovery by Walter Duncan and associates of indicated good production in Rosiclare lime at their 1 Mahurin-Luck, NE SE SE 2-M-25. The area, located south of the Shawneetown-Rough Creek fault zone and long considered by many as unfavorable for exploration, was brought into the picture last November with the completion by Ralph Halbert of a good Tar Springs well, pumping more than 150 bbl. daily, near the east line of the NE SE SE 1-M-25. Nearest production at the time was more than 6 miles to the north in the Sebree area.

The new prospective well drilled by Walter Duncan and associates is approximately 1 mile west of the Halbert producer. It logged the Rosiclare pay at 2,697-2,703 ft., and in a drill-stem test, open 45 minutes, and taking in an interval at 2,691-2,704 ft., flowed clean oil during the final 10 minutes. It started gassing during the first 2 minutes of the test. Indicated bottom-hole pressure was 1,225 psi. Hole was deepened into the McClosky lime to a total depth of 2,780 ft. but a test of the lower zone yielded only gas-cut salty mud. Casing has been run through the Rosiclare to 2,780 ft., and will be perforated opposite that pay. Rotary rig already has been moved off and is drilling at another location 915 ft. to the southwest on the same farm.

INDIANA

Benedum & Trees Oil Co. and Jack V. Canterbury have put their new discovery well, 1 Smith, SE NW SW 1-8s-11w, on production, opening a new pool 8 miles south of Evansville at the south tip of Vanderburgh County. The well was treated with 3,000 gal. of acid and pumped approximately 80 bbl. of oil in the first 24 hours. Production is from McClosky lime at 2,397-2,406 ft. (total depth). Location is on the bank of the Ohio River, just across from the city of Henderson, Henderson County, Kentucky, where a new town-lot drilling program is expected to be launched as a result of the discovery. Operators' now are drilling on their second well, a location northwest of the first.

MICHIGAN

A Dundee dolomite oil showing pay at a wildcat outpost to the south of the Coldwater field, Isabella County, and a Traverse oil show at a Montcalm County wildcat were commanding top interest in the Michigan industry this week.

At the Coldwater field outpost, the Chartiers Oil Co. logged a Dundee oil pay at 3,739-43 ft. at company's 1 Miller. NE SW SW 8-15n-6w, Sherman Township, Isabella County, which circulated an estimated 10 bbl. of oil while 5-in. casing was being run and cemented at 3,737 ft. Dundee top was logged at 3,739 ft. and hole is presently totaled out at 3,743 ft. Wildcat is located just over a mile south of the Coldwater field and about 3½ miles north by west

of the Sherman Dundee oil pool. The 1 Miller is flat with some of the nearest producers in Coldwater and is in the center of an approximate 1,500-acre solid drilling block.

In Montcalm County, Michigan Oil Co. was testing a Traverse oil and gas show at the 1 Towle Estate 1, SE SE SE 17-11n-8w, Pine Township. Traverse lime top was logged at 2,865 ft. and oil showing pay, with gas showing and bailer picking up free oil while cavings were being cleaned from hole, was logged at 2,900-09 ft. A string of 5-in. casing was being run on a packer to test this show before deciding whether it was good enough for completion of this wildcat in its present horizon, or whether it should be deepened on to the Dundee-Detroit River objective. Pay at the 1 Towle Estate was described as being highly porous, vugular crystalline dolomite. Michigan Oil Co.'s wildcat is over a mile north by east from the one-well Pine Traverse field, which has been surrounded by offset failures. This other Traverse pool (one-well) was discovered in 1938 and had produced a total of 68,670 bbl. of oil through 1950—3,454 bbl. in 1950.

OHIO

The Preston Oil 3 Chas. Babcock, Section 15, Perry Township, Coshocton County, extends the old Perry pool a location north and east, and indicates a further extension. Clinton sand at 3,139-85 ft. showed 5 bbl. natural, and 65 bbl. in 24 hours after a 120-qt. shot.

The Mid East Oil 2 Q. M. Neldon, Section 23, New Castle Township, Coshocton County, on the southeast tip of the pool, reported sand at 3,251-3,325 ft. with 10 bbl. natural. The well was shot with 120 qt. and increased to 106 bbl. in 24 hours.

In the Brownsville pool, the Waverly Oil 4 Ross Pipes, Lot 19, Hopewell Township, Licking County, made a good showing of oil and gas natural. In 24 hours after shot, the well made 75 bbl. with

ILLINOIS WILDCAT FAILURES

Clark County: Carter Oil Co. 1 Frahm-Cole-Lee, NE NE SW 28-11n-12w, dry, TD 2,607 ft.

Aurora Gasoline Co. 1 Gard, NW SW SE 20-10n-11w, dry, TD 2,505 ft.

Coles County: E. P. Spicer 1 Allen, NE SW NW 11-14n-10e, dry, TD 426 ft.

Edwards County: C. E. O'Neal, J. B. Buchman and Ashland Oil & Refining Co. 1 Gubbins-Woodham unit, NW SE SE 21-1s-14w, dry, TD 3,140 ft.

Aurora Gasoline Co. 1 Wilks, NW SW SE 5-2s-10e, dry, TD 3,407 ft.

Effingham County: E. F. Moran 1 Maier, SW SE SW 25-6n-5e, dry, TD 2,560 ft.

Clay County: Taylor & Schumacher 1 Anderson, NE NE NW 22-3n-5e, dry, TD 3,015 ft.

Jefferson County: Ralh Halbert 1 Taylor, NW SW NE 19-4s-3e, dry, TD 3,041 ft.

Richland County: Perry Fulk 1 Jackson, SE NE NE 5-2n-9e, dry, TD 3,188 ft.

Wayne County: C. E. Brehm 1 French, NW NW SW 3-2s-8e, dry, TD 3,316 ft.

Whiteside County: E. L. Wirth 1 Guild, NW SW NW 27-19n-4e4th PM, dry, TD 1,178 ft.

INDIANA SUCCESSFUL WILDCATS

Gibson County: J. C. Haynes et al 2 Fisher, Military Donation 91-1s-10w, IP 53 bbl., Aux Vases lime 1,845-50 ft., O'Hara 1,863-69 ft., and Rosiclare 1,881-85 ft., TD 1,921 ft. (extension Union - Bowman pool).

Posey County: F. B. Drilling Co. 1 America Welsh, SE SE SE 3-4s-14w, IP 25 bbl. oil and water, Tar Springs 2,260-65 ft., TD 2,265 ft. (extension Griffin pool).

B. M. Heath 1 Wooley Community, NE SE NE 12-5s-12w, IP 10 bbl., Cypress 2,341-53 ft., TD 2,365 ft. (extension Martin pool).

INDIANA WILDCAT FAILURES

Gibson County: W. Duncan 1 Emerson, NE NE NE 11-3s-12w, dry, TD 2,585 ft.

Greene County: Wayne Markle 1 fee, SE NW NE 31-8n-6w, dry, TD 627 ft.

Lawrence County: Oakridge Oil Co. 1 Wil-

cox, SWc SE NW SE 4-4n-2e, dry, TD 1,753 ft.

Fosey County: Inland Producers, Inc., 1 Irma Hermann, SE NE NE 20-7s-12w, dry, TD 2,811 ft.

Sullivan County: F. B. Cline 1 Gibbons-Downes, SW SE NW 3-8n-9w, dry, TD 1,420 ft.

F. B. Cline 1 Riggs, SE NW SW 36-8n-11w, dry, TD 805 ft.

Vigo County: F. B. Cline 1 Yeager, SE SE SE 34-10n-10w, dry, TD 1,472 ft.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Hopkins County: Lafitte Co. ? Ashby, S½ NE SW SW SW 14-6-26, IP 43 bbl., Tar Springs 2,052-69 ft., TD 2,765 ft. (discovery well Pond River pool).

WESTERN KENTUCKY WILDCAT FAILURES

Henderson County: J. V. Canterbury 1 Barrett heirs, NW SW SW 18-Q-24, dry, TD 2,490 ft.

McLean County: George S. Engle 1 Polley Wright, NE NW NE 12-N-25, dry, TD 2,529 ft.

Muhlenberg County: Dr. G. E. Ellis 13 Brown heirs, SW NE NE NE 11-H-31, dry, TD 435 ft.

Ohio County: H. K. Myers 1 Chapman, SW NE SW NW 1-M-31, dry, TD 1,129 ft.

Union County: Ryan Oil Co. 2 Hancock, NE SE NW NW 21-P-21, dry, TD 2,705 ft.

Webster County: R. Badgett 1 Blackwell, NE NW SW SW 4-L-21, dry, TD 2,613 ft.

MICHIGAN WILDCAT SUCCESSES

Allegan County, Hopkins Township: Ray Jones 1 Gordon, NE NW NW 36-3n-12w, Traverse 1,634 ft., 12 bbl., TD 1,641 ft.

Clare County, Winterfield Township: Louis Rose 1 Brocht, N½ NE SE 2-20n-6w, est. 40 bbl. from Richfield, TD 5,056 ft.

Midland County, Jerome Township: Lakeland Oil Corp. and C. W. Collin 1 Hay Estate et al, NW NW SE 8-15n-1w, Dundee 3,667 ft., 30 bbl., TD 3,750 ft.

Ogemaw County, Mills Township: O. K. West 1 State-Mills, SW SW NW 6-21n-3e, est. 20-25 bbl. from Monroe sour zone, TD 3,642 ft., PBTD 3,616 ft.

Roscommon County, Roscommon Township: E. V. Hilliard R. L. 1 State-Roscommon, N½ SE SW 29-21n-3w, 23 bbl. from Richfield, TD 5,346 ft., PBTD 5,250 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Overisel Township: H. E. Walton 1 Koopman-Lankheet, NE SW SE 9-4n-14w, Traverse 1,476 ft., dry, TD 1,482 ft.

Crawford County, Grayling Township: Gulf Refining Co. 1 Sales, SE SE NE 36-26n-3w, dry in Richfield, TD 4,527 ft.

Montcalm County, Richland Township: Burks C. White 1 Stauffer & Stauffer Comm., NW SW SE 20-12n-5w, Stray sand 1,260 ft., dry, TD 1,313 ft.

Mack Motor Truck Elects Fleming Vice President

P. J. FLEMING

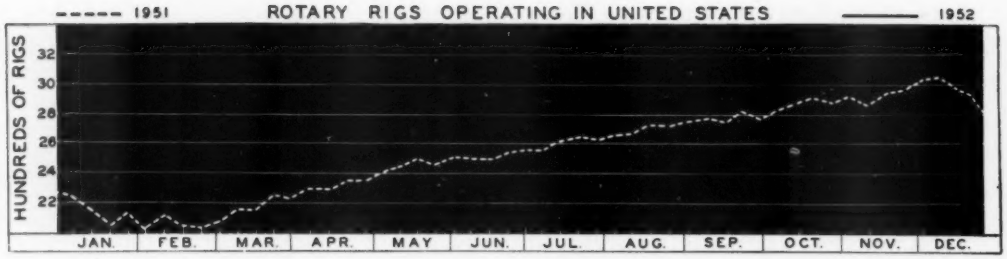
Pierce J. Fleming, manager of Mack Motor Truck Corp.'s Off-Highway Sales Division, has been elected a vice president of the company, it has been announced by H. W. Dodge, executive vice president. A pioneer in the truck sales field, Fleming joined Mack in 1918 and had served as Mack district manager in Buffalo and Cincinnati before becoming district manager at St. Paul in 1938. He was transferred from that position in 1949 to take up his present duties.

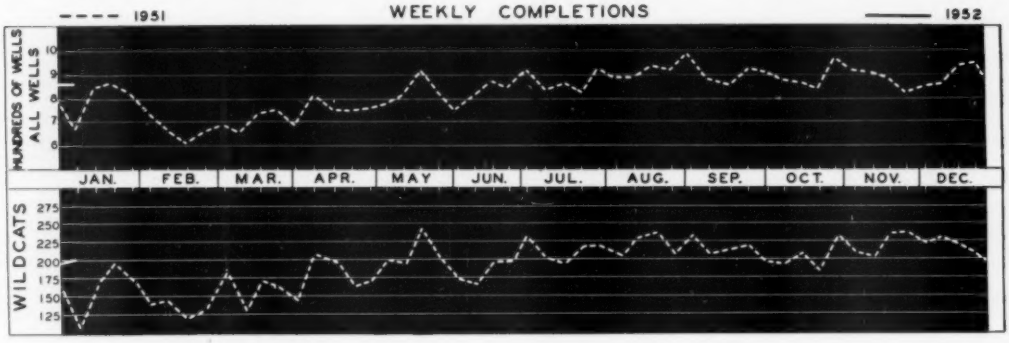
Fleming will continue to make his headquarters in Mack's home office in New Yok City.

Westinghouse Names Hanft To Industrial Department

H. H. Hanft has been named assistant to the manager of the industrial department for Westinghouse Electric Corp. The function of this department is to negotiate and coordinate sales and engineering information in the entire Westinghouse organization.

Hanft was formerly a section manager for the company's transportation sales department. After completing a training course at Westinghouse, he joined the railway equipment engineering department where he gained prominence in the design of heavy locomotives. In 1929 Hanft left Westinghouse to specialize in market research and sales promotion. He rejoined the company in 1941 as a member of the market development department, and 3 years later returned to transportation activities in the industry engineering department. He became manager of the land transportation section in 1949, which position he held until his present appointment.





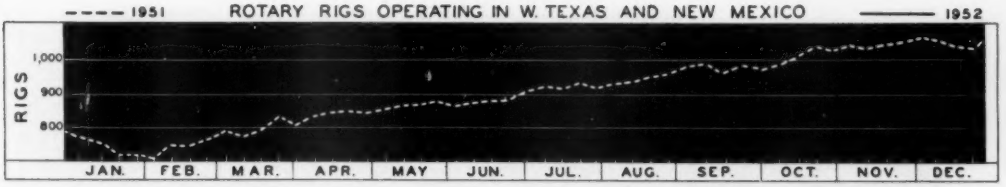
CURRENT STATISTICS

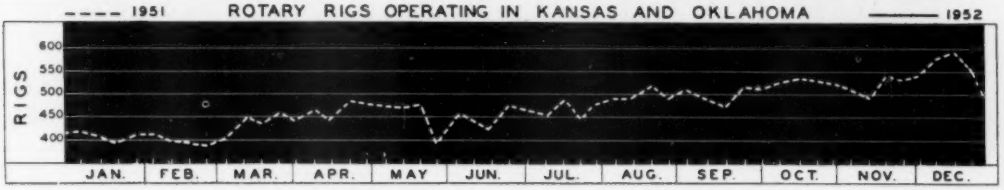
EXPLORATION

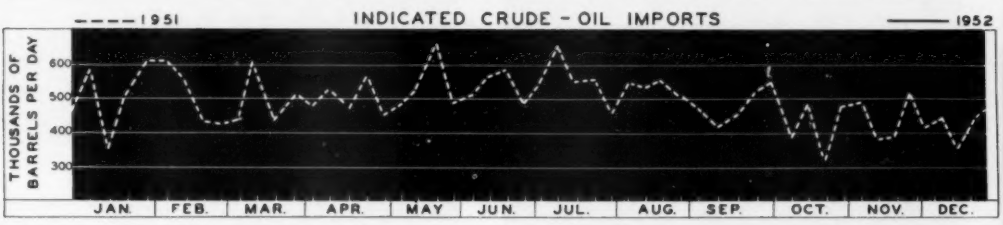
WEEKLY WELL COMPLETIONS . . . . . WEEK ENDED JANUARY 5, 1952

	Total of all wells					Jan. 5		Wildcat completions and discoveries					Cumulative total, 1952				
	Comp.	Oil	Gas	Dry	Footage	1952	1951	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	9	4	0	*5	12,500	6	6	0	0	0	0	0	0	0	0	0	0
Pennsylvania	30	15	4	†11	42,400	21	12	0	0	0	0	0	0	0	0	0	0
West Virginia	13	0	13	0	39,100	9	7	0	0	0	0	0	0	0	0	0	0
Ohio	16	8	2	6	34,701	11	9	0	0	0	0	0	0	0	0	0	0
Indiana	24	9	3	12	41,374	17	25	3	0	0	7	10	3	0	0	4	7
Kentucky	31	14	5	12	60,842	22	15	1	0	0	6	7	1	0	0	4	5
Illinois	41	20	0	21	104,575	29	38	0	0	0	11	11	0	0	0	7	7
Michigan	15	10	0	5	45,718	10	10	5	0	0	3	8	3	0	0	2	5
Kansas	77	32	2	43	272,651	55	42	3	0	0	23	26	3	0	0	15	18
Nebraska	11	3	0	8	60,371	7	1	1	0	0	7	8	1	0	0	4	5
Oklahoma	106	62	5	39	413,240	75	42	1	0	0	5	6	1	0	0	3	4
Texas	262	159	12	91	1,265,922	185	189	10	2	2	67	81	7	1	2	48	58
North Central (Dist. 7-B & 9)	93	46	1	46	312,024	66	55	6	0	0	36	42	5	0	0	25	30
West (Dist. 7-C & 8)	85	66	1	18	502,806	60	51	2	0	0	12	14	1	0	0	9	10
Panhandle (Dist. 10)	10	5	5	0	35,620	7	5	0	0	0	0	0	0	0	0	0	0
Eastern (Dist. 5 & 6)	10	5	1	4	65,510	7	11	0	0	0	2	2	0	0	0	2	2
Gulf Coast (Dist. 2 & 3)	34	23	2	9	214,120	24	32	0	2	1	6	9	0	1	1	4	6
Southwest (Dist. 1 & 4)	30	14	2	14	135,842	21	35	2	0	1	11	14	1	0	1	8	10
Louisiana	59	34	5	20	349,075	42	29	0	1	0	7	8	0	1	0	5	6
Northern	38	20	4	14	131,344	27	19	0	0	0	4	4	0	0	0	3	3
Southern	21	14	1	6	217,731	15	10	0	1	0	3	4	0	1	0	2	3
Arkansas	13	7	0	6	51,505	9	9	2	0	0	2	4	1	0	0	1	2
Mississippi	13	7	1	5	87,219	9	1	1	0	0	4	5	1	0	0	2	3
Southeastern States	2	0	0	2	15,039	1	1	0	0	0	2	2	0	0	0	1	1
Montana	13	1	0	12	32,366	9	0	0	0	0	6	6	0	0	0	4	4
Wyoming	31	9	0	22	165,705	22	8	6	0	0	0	6	2	0	0	2	4
Colorado-Utah	15	8	0	7	71,600	10	2	1	0	0	2	3	1	0	0	1	2
New Mexico	25	11	11	3	123,728	17	5	0	0	0	1	1	0	0	0	1	1
California	50	41	0	9	261,402	35	22	2	0	0	8	10	1	0	0	6	7
Miscellaneous (S. D., N. D., Md.)	3	0	1	2	19,132	2	0	0	0	2	2	4	0	0	1	1	2
Total United States	859	454	64	341	3,570,165	603	473	36	3	4	163	206	25	2	3	111	141
Total previous week	860	468	85	307	3,665,012			27	0	6	161	194					
Total January 6, 1951	677	397	38	242	2,618,749			12	0	2	83	97	12	0	2	83	97

Service wells included. *5, †10.





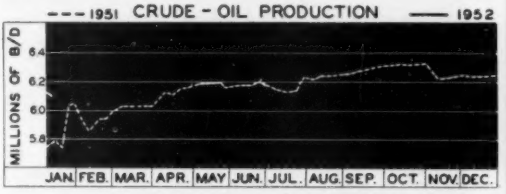


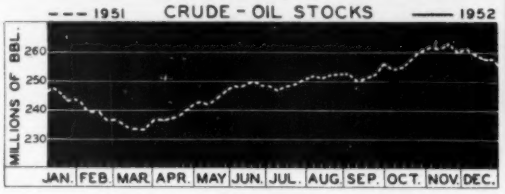
DAILY AVERAGE PRODUCTION FOR WEEK

	January 5, 1952			Dec. 29
	Crude oil	Lease condensate	Total	total
Alabama	2,800		2,800	2,800
Arkansas	77,765	5,385	83,150	83,000
California	988,500		988,500	988,500
Colorado	79,100		79,100	76,200
Eastern	57,500		57,500	56,500
Florida	1,775		1,775	1,725
Illinois	169,600		169,600	168,600
Indiana	32,000		32,000	32,000
Kansas	302,550		302,550	307,200
Kentucky	34,500		34,500	34,620
Louisiana	613,750	38,850	652,600	641,400
North Louisiana	114,300	13,850	128,150	127,850
South Louisiana	499,450	25,000	524,450	513,550
Michigan	37,100		37,100	42,300
Mississippi	98,595	4,650	103,245	104,290
Montana	24,500		24,500	25,000
Nebraska	7,400		7,400	6,000
New Mexico	152,025	300	152,325	148,825
Oklahoma	518,900		518,900	520,100
Texas	2,717,900	45,175	2,763,075	2,796,325
Dist. 1	32,300	225	32,525	32,950
Dist. 2	157,725	3,500	161,225	166,850
Dist. 3	452,825	24,350	477,175	435,850
Dist. 4	247,050	5,145	252,195	256,500
Dist. 5	51,750	325	52,075	52,900
Dist. 6	120,925	4,000	124,925	127,275
East Texas field	268,300		268,300	268,500
Dist. 7-B	83,950	100	84,050	84,400
Dist. 7-C	121,300	6,775	128,075	122,900
Dist. 8	940,800	525	941,325	956,475
Dist. 9	157,425	230	157,655	158,175
Dist. 10	83,550		83,550	82,350
Utah	4,300		4,300	4,300
Wyoming	186,000		186,000	186,000
Total U. S.	6,106,560	94,360	6,200,920	6,225,685
Change from previous week, down			24,765	
Canada	138,100		138,100	138,100

Total U. S. production January 1-5 ..... 31,004,600 bbl.

Same period last year (crude plus cond.) ..... 28,952,000 bbl.



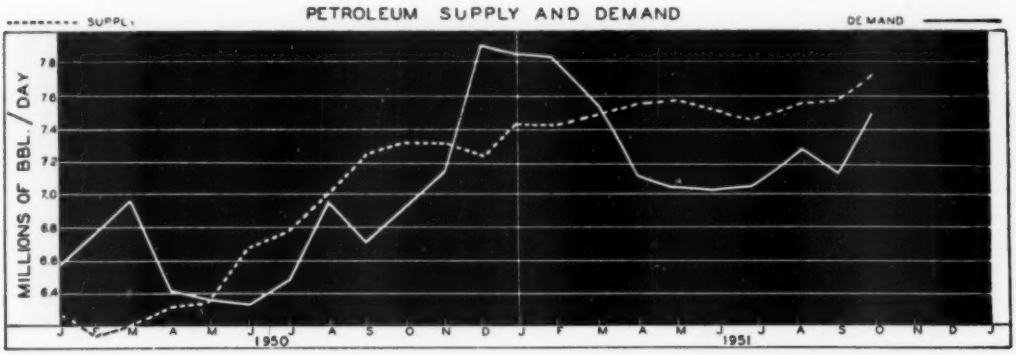


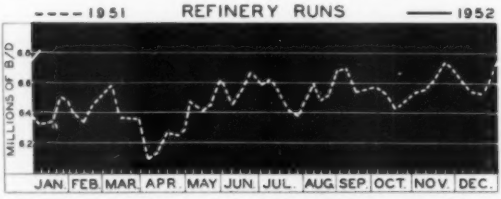
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

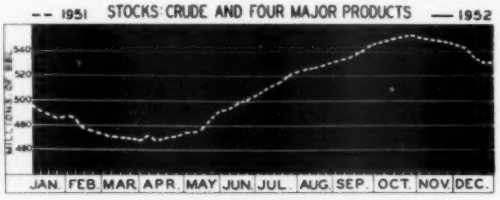
(Thousands of barrels)

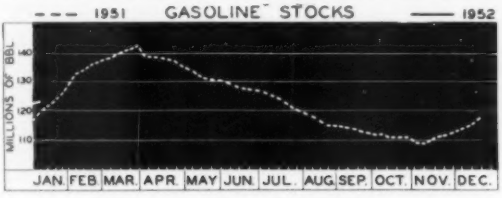
	Dec. 29, 1951	Dec. 22, 1951	Dec. 30, 1950
Pennsylvania Grade	1,881	1,925	2,079
Other Appalachian	1,875	1,626	1,299
Illinois, Indiana, Michigan	11,939	12,138	9,819
Arkansas	2,911	2,930	2,608
Louisiana	13,737	14,227	13,909
North	2,803	2,897	2,638
Gulf	10,934	11,330	11,271
Mississippi	3,330	3,491	2,324
New Mexico	7,369	6,993	6,985
Oklahoma and Kansas	40,890	40,834	39,169
Texas	124,082	124,734	118,293
East Texas	14,609	14,934	14,845
West Texas	53,926	53,731	46,849
Texas Gulf	26,345	27,420	27,932
Other Texas	29,202	28,649	28,667
Rocky Mountain	13,223	13,733	11,475
California	29,821	30,200	31,155
Foreign	5,379	5,280	7,208
Total	256,437	258,111	246,713

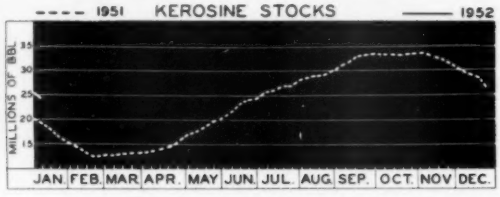
*Bureau of Mines.

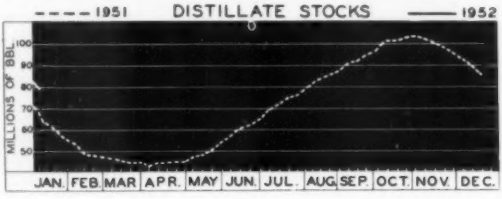


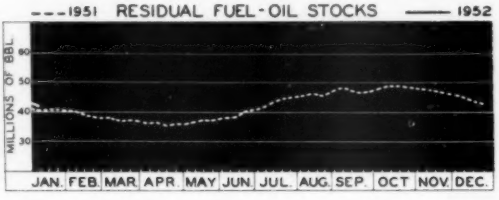










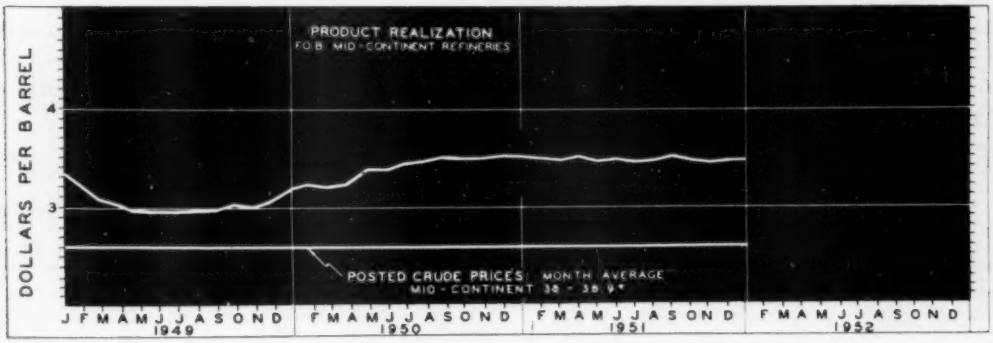


A.P.I. REFINERY REPORT, JANUARY 5

(Thousands of barrels)

District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, January 1951				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production			
											Gasoline*	Kerosine	Distillate	Residual
East Coast	1,045	421.4	47.7	288.8	242.3	24,806	9,073	26,024	10,017	1,004	392.5	41.3	278.6	253.9
Appalachian:														
District 1	107	46.8	7.1	26.9	14.9	2,788	507	790	588	101	43.9	5.1	19.8	12.1
District 2	86	40.9	7.0	14.9	27.6	1,157	236	273	263	72	31.6	5.5	8.2	19.7
Ind., Ill., Ky.	1,294	653.1	84.0	237.0	215.6	29,016	5,310	15,541	5,827	1,195	606.5	82.0	232.8	193.2
Okla., Kans., Mo.	527	303.0	16.9	139.4	66.8	13,855	1,359	9,693	1,769	555	290.2	18.1	137.7	75.9
Inland Texas	238	179.4	16.9	35.9	33.9	4,674	455	1,485	1,253	225	143.6	13.7	33.3	41.7
Texas Gulf Coast	1,675	780.6	147.7	388.6	266.8	19,602	3,934	13,006	6,264	1,584	690.9	147.2	392.8	273.2
La. Gulf Coast	520	216.3	63.6	129.0	59.4	7,152	2,209	2,763	1,834	489	229.9	66.3	128.1	69.9
N. La. and Ark.	80	35.3	6.1	17.0	7.4	2,827	474	1,252	137	81	29.7	9.7	21.5	8.7
Rocky Mountain:														
New Mexico	16	9.6		2.9	4.0	142		64	31	14	8.0	.5	2.5	3.2
Other Rocky Mtn.	219	99.6	4.6	45.1	50.8	4,405	258	1,600	1,054	207	94.5	7.6	41.2	49.4
California	996	407.4	7.7	174.4	376.6	14,785	357	6,895	12,820	923	400.6	13.2	130.7	366.7
January 5, 1952	6,803	3,193.4	409.3	1,495.9	1,371.1	125,209	24,172	79,386	41,857	6,450	2,961.9	410.2	1,427.2	1,367.6
December 29, 1951	6,763	3,211.1	360.4	1,503.1	1,338.7	122,558	25,528	83,792	42,684					
January 6, 1951	6,347	3,007.1	379.6	1,361.1	1,350.3	119,308	19,510	68,198	40,813					

*At refineries including natural blended. †Finished and unfinished.



In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.48 for week ended December 29, $3.47 for previous week, and $3.50 for December 1950.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of January 9, 1952. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10¼-10⅜	12-12.75	10¾-11
Premium gasoline, 86-88 octane	11⅛-11½	13.5-13.75	11¾-12
42-44 w.w. kerosine	9⅛-9½	10-10.1	9
No. 2 straw fuel oil	8¼-8⅜	9-9.25	8
No. 6 residual	$1.65-1.75	$2.45-2.60	$1.75-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La
Grade 26-70	6⅞	6⅜	6⅛
Grade 18-55	8.25	7.75	8.0

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	29-30
200 vis., No. 3 neutral, 0-10 pp.	17.5-18.5

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	5.5

THE lack of response to very cold weather in the North Central states by the residual market is a definite indicator that the natural gas supply in these states is better than many refiners in the Mid-Continent had expected it to be.

In past years, cold weather in the northern states cut off almost all industrial sales of natural gas, since pipe-line capacity was sufficient only to meet domestic and commercial demands. Many industrial and electric-utility plants shifted to residual as a fuel at the beginning of winter.

Mid-Continent refiners report that northern shipments against contracts are near normal but below the level expected. Considering the high demand for heavy fuel on the East Coast and export demand from the Gulf Coast, it was expected that some of the demand in the Appalachian area, normally supplied by shipments from the East Coast, would have to be covered by District 2 production. In times of tight supply, some residual has moved from the Mid-Continent to western Pennsylvania.

Foreign buyers of residual, active for some weeks in the Inland Texas areas, may have to move into Oklahoma in order to cover export requirements.

Light heating oils are very firm on all markets in the country. Movement out of the Mid-Continent area has been heavy in recent weeks. For the country as a whole, distillate stocks dropped more than 4,000,000 bbl. despite an all-time-record production for the week amounting to 10,522,000 bbl.

The delay by the Office of Price Stabilization in reaching a decision on ceiling prices for distillates on the East Coast is a major factor in the lack of spot activity in the district. Suppliers with some material on hand do not wish to sell on today's spot market if there is a good chance that the price soon may be at least 0.5 cent higher. On the other hand, if the ceiling is not raised, suppliers cannot afford to move any excess material from the Gulf Coast at existing spot tanker rates. Tanker demand trends indicate that the rate may stay at MC base plus 200 per cent for the winter.

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.†	Okla-homa, Kansas	Gulf Coast Tex.*	West Tex†
18-18.9	$1.93			
19-19.9	1.98			
20-20.9	2.03	$2.25		$2.12
21-21.9	2.07	2.27		2.14
22-22.9	2.12	2.29		2.16
23-23.9	2.18	2.31		2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.68	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Kettleman Hills, California*	$2.80
Louisiana:	
Beauregard Parish	2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.25
Southwest Pennsylvania	3.82
West Virginia	3.76
Illinois Basin	2.77

*37°-37.9°.

EQUIPMENT MEN . . . in the News

A-1 Bit & Tool Promotes Estes to High Post

H. E. ESTES

Harry E. Estes has been appointed to fill the newly created position of assistant to the president of A-1 Bit & Tool Co., according to C. L. Clausel, president.

Estes brings to his new position a background of 23 years' experience in oil-field-equipment manufacture. He has been associated in various capacities with Gulf Refining Co., Houston Foundry & Machine Co., Rogers Asbestos Co., and Reed Roller Bit Co. For the past 5 years he has served as purchasing agent and director of public relations.

Ray Osborn will succeed Estes as purchasing agent.

Capaul Elected to High Office by Glass Fibers

R. W. CAPAUL

At a recent meeting of the board of directors of Glass Fibers, Inc., Raymond W. Capaul was elected vice president and general manager. This announcement was made by R. H. Barnard, president of the firm. Capaul joined Glass Fibers in 1948 as electrical division manager and was promoted to general sales manager in July 1949. Capaul served 12 years with the Power Sales Division of Toledo Edison Co. before joining Glass Fibers.

Dow Chemical Names Koch To Special Sales Post

Donald Williams, director of sales for The Dow Chemical Co., recently announced the appointment of Fred A. Koch of Dow's New York office as special assistant to Donald K. Ballman, general sales manager.

With the establishment of two new Dow international subsidiaries, Clayton S. Shoemaker, Dow's former eastern sales manager, has resigned his post to head the new organizations.

Koch has been associated with Dow since 1919, and prior to his new appointment he held the position of assistant eastern sales manager for 8 years. The positions of eastern sales manager and assistant eastern sales manager have been discontinued.

Edco Pipe & Supply Opens Tulsa Office

Edco Pipe & Supply Co. has announced the opening of a Tulsa office. The company will handle oil-field tubular material and oil-field supplies.

Edco will retain its yard in Drumright, Okla. The main office in Tulsa will be in charge of Edward N. Cohn, owner of the company.

Butler Mfg. Observes 50th Anniversary

On December 6, 7, and 8, Butler Manufacturing Co. held a 3-day series of open-house tours, which occasion was the observance of the fiftieth anniversary of the founding of the company. Some 5,000 residents of greater Kansas City and industrial leaders from various parts of the country were guests of the company during the celebration.

The announcement of the appointment of John A. Morgan to the post of general manager was made by Oscar D. Nelson, president. Morgan's rise to a top management position spans a career of a little more than 12 years with the company. He joined Butler to work in the sales and advertising department. In his new position he will be making the policy decisions affecting all phases of the company's operations.

Morgan will be at the helm of a company which has nearly 3,000 employes with plants in Minneapolis; Galesburg, Ill.; Richmond, Calif., and Birmingham, Ala.

John A. Morgan discusses his new appointment as general manager with Oscar D. Nelson, president of Butler Manufacturing Co.

Holtz to Manage American Meter Dallas Plant

American Meter Co. has announced the appointment of Donald C. Holtz as manager of the new Dallas orifice-meter assembly plant and warehouse.

Holtz was first employed at the Erie factory of American Meter in 1935 and was engaged in production work until 1940. He served 4 years in the U.S.A. Corps of Engineers. Prior to his appointment as manager, Holtz was employed as an engineer in the orifice-meter department of the Erie factory.

Frontier Now At Planned Level of Operations

C. W. CANNON

Frontier Chemical Co. is now in full-scale production of caustic soda, muriatic acid, and chlorine at its new electrochemical plant in Wichita. These products are now available for prompt delivery to the oil industry in the Mid-Continent area. During the past 5 years, Frontier has been supplying these chemicals to the Southwest and more recently to the Rocky Mountain area from production at Denver, Colo., and Denver City, Tex.

The company supplies large quantities of muriatic acid for oil-well acidizing and is one of the large volume suppliers of caustic soda to oil refineries and natural-gasoline plants for treating their products.

An affiliated company, Frontier Salt Co., Brownfield, Tex., furnishes salt for oil-well mud in drilling through the salt section in the Permian basin. Frontier Chemical is also a large supplier of flake caustic soda for use in oil-well mud.

To centralize the pattern of its expanded services to the oil industry, Frontier's home offices were recently moved from Midland, Tex., to Wichita. In addition to the plant locations, sales offices are maintained at Midland, and Denver. Curtis W. Cannon is president of Frontier Chemical and sales are handled by C. M. Thompson, vice president and sales manager.

Kemper to Head Distributor Sales at Watson-Stillman

J. KEMPER

Watson-Stillman Co. announces the appointment of Jackson Kemper as general manager of sales, distributor products division. Kemper, who joined Watson-Stillman in April 1951 as assistant to the late A. G. York, vice president, brings to his post with the Roselle, N. J., firm many years of experience in sales management and engineering.

Domestically, Kemper's background includes executive and field sales work with the top engineering and purchasing personnel of engineering consultants, utilities, petroleum, chemical, textile, and general manufacturing firms. In addition, Kemper has traveled widely throughout Mexico, South America, and the Caribbean Islands in connection with the establishment and training of foreign representation for a leading American manufacturer of distributor products. Prior to undertaking sales-engineering duties, Kemper acquired valuable experience as a machine designer and estimator.

Beard Made Midwest Sales Manager of Turco Products

S. G. Thornbury, president, Turco Products, Inc., has announced the appointment of Archie K. Beard as Midwest sales manager. Harold P. Glavin has been named to the post of general manager, midwest division factory of Turco, with headquarters in Rockdale, Ill.

Beard, formerly Turco's district

A. K. BEARD

H. P. GLAVIN

manager in Cleveland, has been transferred to Chicago. He will be in charge of sales for the midwest area. Beard joined Turco as a technical service engineer in September 1945, and assumed the Cleveland district managership in January 1948.

Glavin, who for the past year has been office manager of Turco's Los Angeles business office, will coordinate factory and office operations in the midwest division. He joined the accounts payable department of Turco in January 1947, and since that time has worked his way up through the organization's ranks. He was formerly in charge of the billing and accounts payable departments of the Los Angeles business office.

The newly acquired modern Rockdale factory, completely equipped with new manufacturing equipment, will be geared to produce both powder and liquid industrial chemical compounds for Turco's midwest sales area.

Waukesha Appoints Lemmer Advertising Manager

H. J. LEMMER

Waukesha Motor Co. has announced the appointment of Harry J. Lemmer as advertising manager.

Lemmer entered the Waukesha organization in 1942, following a number of years as Chicago passenger traffic representative for Union Pacific Railroad and service in the passenger and promotion departments of the Illinois Central and Chicago Great Western railroads. In 1946 he assumed the duties of assistant advertising manager, which position he held for 5 years.

Waukesha Motor manufactures industrial and heavy-duty truck-type engines and power units, and fuel-rating laboratory engines.

Cooper-Bessemer Appoints Johnson to New York Office

ROY JOHNSON

Cooper-Bessemer Corp. has recently expanded the company's sales engineering facilities with the appointment of Roy W. P. Johnson to its New York office. Prior to his comprehensive engineering training on engine and motor-driven compressors at Cooper-Bessemer's factory in Mount Vernon, Ohio, Johnson was on contract with Andian National Corp. as mechanical engineer in Colombia.

Johnson's efforts in the New York district will be under the direction of James W. Reed, where he will consult with engineering firms in regard to the design and construction of major pipe lines, petroleum processes, allied refining and industrial applications in which Cooper-Bessemer engine and compressor equipment is widely used.

Trackson Co. Interests Sold to Caterpillar

Trackson Co., of Milwaukee, a producer of tractor-mounted machines, has become a wholly owned subsidiary of Caterpillar Tractor Co.

Louis B. Neumiller, president of Caterpillar, will be chairman of a reconstituted Trackson board of directors which will include Walter H. Stiemke, Trackson president, and the following Caterpillar officials: William Blackie, Ralph M. Monk and J. R. Munro.

Stiemke and L. E. Dauer, Trackson vice president, will continue in their present administrative capacities. Henry Gotfredson, secretary and treasurer of Trackson, wishes to retire and will be succeeded by George L. Scripps, who will relinquish his office as assistant treasurer of Caterpillar.

Trackson's two Milwaukee plants occupy approximately 150,000 sq. ft. of manufacturing and office space. Principal products are Traxcavators, TracLoaders, pipe layers, swing cranes, earth augers, treedozers, brush rakes, anglegraders, and anglefillers.

Oil Well Promotes Cumming To Export Division Manager

D. R. CUMMING

The promotion of D. R. Cumming from sales manager to division manager of Oil Well Supply Co.'s Export Division was announced recently by K. B. Winstead, general manager of sales. Export Division headquarters are located at New York City.

Cumming succeeds M. E. Keenan, who retired after more than 30 years' service.

Cumming spent 3 years with Lago Petroleum Corp. in Venezuela before joining Oil Well in 1937. He represented the company in Trinidad and later London and returned to New York City in 1939. The following year he transferred to Buenos Aires, remaining there until 1942. In 1945, upon his return from World War II, Cumming was named sales manager of the Export Division.

Hare Made District Manager

A. A. Hare, assistant district sales manager in the Pittsburgh office of The Youngstown Sheet & Tube Co. since April 1945, has been named district sales manager. He succeeds G. B. Strausner who voluntarily retired after 40 years' with the company.

(Additional Equipment Men in the News on page 159)

CLASSIFIED ADVERTISING

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

UNDISPLAYED CLASSIFIED 15c a word one issue. 10% Discount three or more consecutive issues. $3.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

EQUIPMENT FOR SALE

FOR SALE: Seamless casing and tubing, new and second hand. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

FOR SALE: Westcott, Foxboro and Emco Gas Meters. Geo. R. Milner, Box. 124. Okmulgee, Oklahoma

FOR SALE: One super model Wilson single drum servicing unit, 80 hp Waukesha 4,000' wire, all tubing tools, mounted on GM 4-wheel drive truck $3500. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

2,500 FT. ROTARY Rig Complete. 5 miles south of Wewoka. Call or write Jewell Jackson and L. O. Moore, 1010 East Main, Holdenville, Oklahoma.

FOR SALE: One 125 H.P. Allis-Chalmers 1170 RPM 220 Volt, 31 Amphere, Type A.R. code F. 3 phase, 60 cycle, 24 hour, 40 degree rise induction electric motor. Never used. In original crate, priced at $1500.00. Located Cushing Refinery, Cushing, Oklahoma. Contact Huitt, Deep Rock Oil Corporation, Box 1051, Tulsa, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

NEW HIGH PRESSURE HOSE

Perfect Condition

6 in. diam., 20 ft. long 150 lbs. working pressure; standard nipples and flanges.

Price $200.00 each

4 in. diam., 30 ft. long, 150 lbs. working pressure. Heavy duty standard bronze couplings.

Price $200.00 each

All neoprene, oil resisting with steel coil core. Replacement will cost more than three times the above price. Stock up now while it lasts.

G. Peters

430 Dauphine St.

NEW ORLEANS 16, LA.

EQUIPMENT FOR SALE

PIPE
All sizes; line pipe and casing, tanks, and Oilfield supplies. Edco Pipe & Supply Co., Phone 98434, P.O. Box 4193, Tulsa, Oklahoma.

SPUDDERS, rotaries, core drills. New and reconditioned equipment. Tools, cable, drill pipe, casing, tubing, pump jacks in stock. Everything for well service. Fishing tools rented. Pressey & Son, Pueblo, Colo.

7500' OF API Full Hole 4½" Drill Pipe. Graded and tested by Sonoscope engineers. Milford Giffin, Giffin Hotel, Tel. 477, Hoisington, Kansas.

FOR SALE: Two 3000 bbl. Butler bolted tanks good condition. Can ship immediately. Wentz Fuel Oil Company, 1012 N. 16th St., Lincoln, Nebraska.

THREE 4⅝" x 30' Drill collars. American overshot. One 9" x 25' Drill collar. One elevator for drill pipe. Kiowa Drilling Company, Inc., 717 Union National Bank Building, Wichita, Kansas.

COMPLETE GEOPHYSICAL EQUIPMENT

Everything needed including gravity meter, magnetometer, advanced surveying equipment and two four-wheel-drive jeeps, all in excellent condition. Geophysical firm in Texas merging with firm in northern California must sell for quick sale. Value of equipment, $20,000. Sale price, $8,000.00.

Write for particulars.

Box E-547, The Oil and Gas Journal, Tulsa, Oklahoma

STAINLESS STEEL TANKS

3,000 gal. 5'x21'6"x¼" Type 430.
2,300 gal. 5'x16'x¼" Type 304.

TANKS

100,000 gal. 26'x24'x¼".
15,300 gal. 9'x32'x3/16".
8,500 gal. vert. 8'x23'x5/16" (unused).
4,100 gal. vert. 5'x28'x¼" (unused).
2,100 gal. 9'x3'6"x3/16" cone bottom.
1,600 gal. 8'x7'x3/16" cone bottom.
1,100 gal. 5'x7'8"x¼".

TANK CAR TANKS

6,500 gal. 76"x26'7"; shell 11/16" & 5/16".

PRESSURE VESSELS

10,400 gal., 7'x37'; 300 PSI test.
8,200 gal., 6'x40'x2", 390 PSI.
3,500 gal., 5'x23'x¾", 200 PSI (4).
2,000 gal., 5'x13'7½", 106 PSI.
1,250 gal., 4'x14', 106 PSI.
1,200 gal., 42"x16'8"x5/16", 125 PSI, ASME U69.
1,050 gal., 4'x12'x½", 106 PSI.

HEAT & POWER CO., INC.

70 Pine St., Hanover 2-4890, New York 5
Machinery & Equipment Merchants

EQUIPMENT FOR SALE

USED rotary and cable tool drilling tools wire lines, E. A. Kelly, Box 861, Oklahoma City. Phone 5-6407.

FOR SALE: Ten model WJD-3-A Briggs Lube Oil Clarifiers. Alfred B. Kern, 223 Wright Bldg., Tulsa, Oklahoma.

5,000 GALLON LIQUID STORAGE TANK made by Mosher Steel Co. weighs 41,650 lbs. Over-all length 35 ft. 5 in.; outside diameter, 60 in.; shell thickness, 11/32; head thickness, 7/16; maximum working pressure, 80 lbs.; tests to 160 lbs. Write or wire Kenneth Hall, Oak Ridge, La.

OFFERED FOR SALE

6—Used Fuel Oil Storage Tanks

One 80,000 Bbl. all steel located Leesville, La.
Two 55,000 Bbl. all steel located Minden, La.
One 55,000 Bbl. wood roof, steel tank located Minden, La.
One 55,000 Bbl. all steel located Bossier City, La.
One 20,000 Bbl. wood roof, steel tank located Heavener, Okla.

3—Used Water Storage Tanks

One 50,000 Gal. all steel located Baton Rouge, La.
One 50,000 Gal. all steel located Campti, La.
One 50,000 Gal. all steel located Kansas City, Mo.

These tanks have been used to store fuel oil for train engines only, and are located on RR Right-of-ways, and can be moved easily on RR Cars. All offers subject to prior sale. Most all are No. 1 used steel, ideal for re-erection. Anyone interested please contact

CLYDE DAMPF, Inc.
1400 NE 3rd, Telephone 3.5050
Amarillo, Texas

Reconditioned Seamless TUBING

1½" O.D.
2" O.D.
2¼" O.D.
3¼" O.D.
3½" O.D.
4" O.D.
5½" O.D.

5 miles or more of each size available in single or double random lengths, plain ends, beveled for welding.
Ideal for gas, water, oil, and air lines.

Write—Wire—Phone

SONKEN - GALAMBA Corporation
2nd and Riverview (X-790)
Kansas City 18, Kansas
THatcher 9243

EQUIPMENT FOR SALE

USED Baash-Ross block-hook combination, 150-ton, four sheave 1⅛" $2300. Good condition. General Equipment Co., Inc., 815 Daniel Bldg. 2-6764, Tulsa, Okla.

2000' Portable Rotary Rig complete. New 5 x 8 Pump mounted separate. 1700' 3½" drill pipe. Rig can be sold with or without pipe. 4226 Ocean Drive, Corpus Christi, Texas.

PATENT RIGHTS on new high pressure non-stick plug valve. Royalty or cash basis. Harris, 3325 James, Fort Worth, Texas.

EVERYTHING in Cable Drilling tools, new-used, 4600 items. Send for list. TRI STATE TOOL & SUPPLY CO., Box 827, Parkersburg, W. Va.

FOR SALE: Ten 5½ Lufkin crank 72" stroke pumping units complete with 15/30 H.P. electric motors and motor houses. Purchased 1934 never used. Located 4 miles east Gladewater, Texas. Priced $1800 each. Contact Huitt, Deep Rock Oil Corporation, Box 1051, Tulsa, Oklahoma.

KEYSTONE spudder, trailer mounted, truck and tools. Located Washington County, Oklahoma. Working on seven hundred foot well. Box E-385, The Oil and Gas Journal, Tulsa, Oklahoma.

Oil County
TUBULAR GOODS

Completely, equipped, well established fabricator has production time available to convert your seamless tubing and pipe by upsetting, threading and hydrostatic testing, to A.P.I. Specifications.

Plant location is on main line railroad within the Pittsburgh switching zone.

Phone or Write
McKeesport 4-9107
Box 405, McKeesport, Pa.

EQUIPMENT WANTED

WOULD like to purchase, or trade for, approximately 6,000' of new 27/8" OD, Grade D seamless drill pipe with super shrink grip threads. Box E-530, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Walker-Neer 5-33 or similar rig without tools. Must be in good shape and reasonable. Ralph Stubble, Chatham, Ontario.

WE BUY well drilling equipment, machines, cable tools, pipe, etc. Turn your surplus equipment into cash. Pressey & Son, Pueblo, Colorado.

WANTED: Triplex Type Pumps, minimum 500 barrels per day capacity at 1,000 PSI and 0 to 10 PSI suction and up. 1" Regular Black Line Pipe; 1" long collar line pipe and 1¼" upset tubing. Must be in good condition. Lynch Oil Company, P. O. Box 814, Evansville, Indiana.

WANTED: One 40 HP Bettis steamer. Must be in good condition and reasonable. Box E-533, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL BUY used 50 or 51 model Bucyrus-Erie 36-L or 28-L at a used price, trailer mounted. Box E-545, The Oil and Gas Journal, Tulsa, Okla.

HELP WANTED

PETROLEUM engineer approximately 38-40 years of age with production and drilling experience to take active part in the promotional work of a well established oil well service company covering the Mid-Continent area with headquarters in Houston. Send reply to Box 8013, Houston.

TECHNICAL WRITER
Good position on Tulsa publication staff of Major Oil field service company. Opportunity for advancement. Write Box E-538, The Oil and Gas Journal, Tulsa, Oklahoma. Give experience, age and Qualification.

ENGINEERS, Executives, Technical Men Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 534 Frick Bldg., Pittsburgh 19, Pa.

HELP WANTED

REFINERY Chief Engineer 26-40 with experience in both process and mechanical engineering; should be qualified to supervise mechanics of modern refinery with catalytic operation. Contact The Derby Oil Company, Wichita, Kansas.

KEY Seismograph Personnel Needed by Established and Expanding Seismograph Company. Box E-264, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH. Excellent opportunity for experienced geophysicist with aggressive independent contract company to supervise contract crew. Salary dependent on experience. Write giving details, all replies held strictly confidential. Box E-513, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED petroleum refinery process engineer with good prior training in both process engineering and plant operation. If you have satisfactory training and experience the position is in line for top job in a Mid-Continent refinery. Box E-488, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Subsurface geologist with 3 to 5 years experience in subsurface mapping in North or West Texas area. Include details of education and experience. Replies confidential. Box E-520, The Oil and Gas Journal, Tulsa, Oklahoma.

ADMINISTRATIVE and field sales personnel. Engineering education and/or background necessary. Knowledge of petroleum and chemical industries desirable. Apply: The J. B. Beaird Company, Inc., P.O. Box 1115, Shreveport, Louisiana.

SHIFT SUPERVISOR—Responsible for supervision of Catalytic Cracking and Poly Plant operations, plus general supervision over process workers during shift. Must be experienced and thoroughly familiar with all phases of refinery operation. Location—Artesia, New Mexico. Write New Mexico Asphalt & Refining Company, Artesia, New Mexico, giving full particulars of qualifications, experience and references.

EXPLOITATION engineer, experience production geology and reservoir engineering problems, 4 to 5 years experience, age 28-35 years, married or single for position in South America. Climate and camp facilities desirable with strong independent oil company which has very promising future. Salary in line with experience, capabilities and educational background. Box E-526, The Oil and Gas Journal, Tulsa, Okla.

EXPERIENCED Production Wellhead equipment engineer, familiar with separators, heaters, treators and controls, able to design equipment, develop and supervise installations in field. Permanent position with Tulsa area Fabricator. Our employees know of this advertisement. Reply Box E-536, The Oil and Gas Journal, Tulsa, Oklahom.a

HELP WANTED

SEISMIC crew members and part chiefs, $300-600. Many other oil jobs, Rocky Mountain area, all types technical men and recent graduates. Professional Placement Service, 516 University Bldg., Denver, Colo.

EXPERIENCED landman wanted by Independent Oil Company, age 25-30, with good personality. Must be familiar with all phases of land and leasing work. West Texas-New Mexico experience required. Give full information regarding past employment record, educational background, and salary expected. All replies will be handled strictly confidential. Box E-535, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC SUPERVISOR—Outstanding opportunity for a capable geophysicist who is able to supervise seismic crews for an expanding contract company. Minimum of five years' experience necessary. Box E-542, The Oil and Gas Journal, Tulsa, Okla.

EXPERIENCED surveyors and computors for foreign service with Gravity Crews. Top salary, subsistence, and travel expense. Best working conditions. Our personnel has knowledge of this ad. Apply Box E-543, The Oil and Gas Journal, Tulsa, Oklahoma.

RELIABLE and industrious LAND MAN wanted who is free to travel, purchasing royalty mineral rights and some leases, 25 to 45 years of age. Ability to check ownership records desirable. Box E-544, The Oil and Gas Journal, Tulsa, Okla.

CONSULTING ENGINEER with wide scope of chemical and petroleum clients has opening for qualified chemical engineer, good education, personable, experienced in process design and operations, especially in petroleum. An outstanding opportunity for industrious and resourceful man. Box E-541, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Man some experience in Gas Measurement and Gas Testing. Location South Central Louisiana. Salary $247.50 per month. **House and Utilities Furnished.** State age, education and experience. Box E-531, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED FOR CHEMICAL PLANT LOCATED IN SOUTH
ESTIMATORS

Must be experienced engineers, under 45, familiar with Refinery and Chemical Plant design and capable of estimating process equipment installations from flow diagrams and specifications. Give full information, experience record and salary expected in first letter. All replies confidential. Box E-519, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS

Major Petroleum Refinery Construction Company located in New York City desires to add to its expanding staff. If you can qualify for one of the jobs listed below and are interested in a challenging opportunity please submit your resume in detail and past earnings record to the box number below. Our employes know of this ad.

SCHEDULING ENGINEER experienced in job scheduling preferably on petroleum or chemical plants starting with the engineering and proceeding through procurement and construction.

CONSTRUCTION SUPERINTENDENT must have experience in construction of oil refineries and the exercise of executive authority at job site. Must be able to travel.

ASSISTANT TO CONSTRUCTION AND PROCUREMENT SUPERVISOR requires supervisory field erection experience on oil refineries and chemical plants as well as some experience in procurement, expediting and inspection of refinery equipment. Headquarters in New York City with some travel required.

Box E-534, THE OIL AND GAS JOURNAL, Tulsa, Oklahoma

HELP WANTED

OIL Industry Employment Service, Tom Robinson, owner, 405 Tuloma Building, Tulsa, Okla. 4-5974. No fees. For technical and trained oil industry personnel. Write us. Needed now: Geologists with Masters some experience. Experienced oil well supply salesmen.

SIZABLE INDEPENDENT OIL producing company needs an aggressive, experienced production man. Must be thoroughly experienced in drilling, completions and production. Will act as superintendent over Oklahoma properties. Technical background desirable. Age under 40 Excellent salary and opportunity for right man. Give full details first reply, which will be kept confidential. Box E-525, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEERING
WIRE ROPE IN OIL FIELDS

One of the leading integrated manufacturers of wire rope seeks mature engineer familiar with rotary drilling equipment particularly, and possessing inherent desires and personality to sell. Initial location to be in Rocky Mountain area servicing oil fields, however future opportunities are unlimited, dependent upon the man. Remuneration dependent upon experience, etc.; if interested write this periodical care Box E-537, The Oil and Gas Journal, Tulsa, Oklahoma, giving full details on education, experience, salary desired, etc. Your inquiry will be held in strict confidence; our organization knows about this advertisement.

SITUATIONS WANTED

GRADUATE MECHANICAL ENGINEER. Age 31, married. 6 years varied refining experience in staff, cost reduction, equipment selection, construction, and maintenance engineering. Desires permanent employment in refining or allied fields. Box E-524, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Age 35, married, 13 years major and independent company experience in Texas and Louisiana Gulf Coast, Southwest Texas, West Texas-New Mexico, Colorado-Nebraska. Desire connection with Active independent. Excellent references. Box E-521, The Oil and Gas Journal, Tulsa, Oklahoma.

BSME 1950, Major in power, Minor in Metallurgy. Five years USNR, age 27, one year experience in oil field. Desire position as experimental engineer or similar work, Houston area. Box E-529, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM CHEMIST, B.S.: 20 years experience in refinery laboratory and refinery operation. Available at once. Prefer Midwest or Southwest location. Box E-523, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No 131, Hobbs, New Mexico.

ATTORNEY, experienced in leasing and title work. Also have thorough knowledge of Federal income tax laws relating to oil matters. Energetic. Presently employed. Desire connection with independent firm or individual located in Southwest. Box E-546, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum Engineer — One and a half (1½) years production and drilling experience in Southwest. Would like connection with going independent with opportunity to learn and advance. Presently employed. Box E-532, The Oil and Gas Journal, Tulsa, Oklahoma.

CORROSION and communications engineer with ten years experience desires permanent, responsible position with utility or pipe line company. Box E-540, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908 Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing Catalog and Samples on request. Burkhart Printing & Stationary Company, 115 South Cincinnati, Tulsa, Oklahoma.

ROYALTIES

MONTANA ROYALTIES

Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1232 Great Falls, Montana.

LEASE AND DRILLING BLOCKS

FOR SALE: Oil lease on E½ 3-50-1w5. This property is midway between fabulous Golden Spike and Wizard Lake fields. Apply: Box 562, Leduc, Alberta, Canada.

WILL buy for cash, leases, royalties, mineral deeds, all areas. Write in confidence to Box E-539, The Oil and Gas Journal, Tulsa, Oklahoma.

HAVE three (3) drilling blocks, Brown Coleman Co. 1000—1900 acres—deep and shallow rights—wildcat wells. S. S. Thomas, Box 297, Brownwood, Tex. Phone 8695.

1500 ACRE drilling block in southern Oklahoma open for farm out, producing wells joining east side. Surrounding acreage leased on three sides. Write P. O. Box 321, Wichita Falls, Texas.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver Colorado.

THOUSAND acres oil leases adjoining production in Wharton County, Texas, will produce in Cockfield-Wilcox zone. Three pipe lines cross leases, assuring market. Acreage available in other county's shallower production. Write for information. H. F. Priesmeyer, Garwood, Texas.

CAPITAL immediately available for geologically attractive Drilling Deals and Oil Producing Properties. Send full particulars. Box E-434, The Oil and Gas Journal, Tulsa, Oklahoma.

HUGOTON Embayment and Anadarko Basin Leases & Royalties, Western Oklahoma and Southwest Kansas Areas. John P. Mathis, P. O. Box 1106, Amarillo, Texas.

APPROXIMATELY 700 acres: Texas Panhandle near big showing well nearing completion; either sell lease or full title. Independent company can do well; exploring all done and paid for. John E. Welton, 239 S. Prospect Street, Bowling Green, Ohio, for full details.

FOR SALE: Oil and Gas Leases adjoining producing leases, also wildcat leases, drilling propositions and small producing properties; all in shallow territory. W. P. Harley, Bowling Green, Ky.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6633 Delmar Ave., St. Louis 5, Mo

NORTH DAKOTA
LEASES and MINERALS

Our latest lists with prices mailed on request. We solicit only those connected with the Oil Industry, or Royalty business. References exchanged.

JOHN ALLEN
200 Grand Pacific Hotel Phone 3850
Bismarck, North Dakota

BUSINESS OPPORTUNITIES

OFFICE—WAREHOUSE SPACE
with 24-hour telephone answering service in
VICTORIA, TEXAS
for oil and related industrial firms.
Please contact
TRI-STATE SPECIALTY WAREHOUSE CO.
Houston (6), Texas. P.O. Box 6125
LYnchburg—8061
Victoria, Texas. P.O. Box 23, Ph. 3264

BUSINESS OPPORTUNITIES

ORGANIZATION now serving as manufacturers representatives seeking additional quality lines for oil field and industrial trade in Oklahoma, Kansas, and Texas. P. O. Box 1201, Tulsa, Oklahoma.

WANT
N. Y. EXPORT REPRESENTATION?

Long established and well known oil well equipment manufacturer who has maintained N. Y. export office and sales personnel for many years, is now in a position to handle additional representation in New York for high quality manufacturers of oil equipment items. If you're looking for increased export business, write for further information. All replies held in strict confidence.

Box E-359, The Oil and Gas Journal, Tulsa, Oklahoma

MACHINE SHOP

A city of 16,000 population wants an Oil Field (or similar) Machine Shop. A substantial amount of contract work is immediately available and local money can be had to erect suitable building on a lease basis.

PHONE OR WRITE

Industrial Development Dept.

PUBLIC SERVICE COMPANY OF OKLAHOMA

P.O. Box 201 Tulsa Phone 2-6171

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, Washington 25, D. C. Notice is hereby given that two parcels of land in T. 32 N., R. 82 W., 6th P. M., Wyoming, containing approximately 480 acres, within the known geologic structure of the Iron Creek field, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1 p. m., Eastern Standard Time, March 5, 1952, when bids will be opened. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Manager of the Land and Survey Office, Cheyenne, Wyoming, or to this office. Marion Clawson, Director.

LEGAL

15,482 acres of Tribal and 11,263 acres of allotted Indian lands located in Twp. 11 N., Rgs. 21, 22, & 23 E.; Twp. 13 N., Rgs. 18, 19, 20, 21 & 22 E.; Twp. 14 N., Rgs. 22, 23 & 24 E.; Twp. 15 N., Rge. 20, 21, 23 & 24 E.; Twp. 16 N., Rgs. 20 & 24 E.; Twp. 17 N., Rge. 24 E., BHM, in the Cheyenne River Reservation, South Dakota, are being advertised for oil and gas leasing, bids on which will be opened January 15, 1952, at 2:00 P.M., C.S.T., at the office of the Superintendent of the Cheyenne River Indian Agency, Cheyenne Agency, South Dakota. Full description and copies of the advertisement may be obtained from the superintendent, Cheyenne River Indian Agency, Cheyenne Agency, South Dakota, or from the Oil and Gas Supervisor, U. S. Geological Survey, Federal Building, Casper, Wyoming.

LEGAL

5,025.33 ACRES of Tribal and 80 ACRES of Allotted Indian lands located in Townships 2, 3 and 4 South, Ranges 8, 9 and 10 West, within the jurisdiction of the Uintah and Ouray Reservation, Utah, are being advertised for lease, bids on which will be opened January 18 at 2:00 P.M., at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, 25, D. C. Notice is hereby given that the lands listed herein are offered through sealed bids on the terms hereinafter specified, to qualified bidders of the highest cash amounts per acre, as a bonus for the privilege of leasing the lands under sec. 17 of the Leasing Act of February 25, 1920 (41 Stat. 437; 30 U.S.C. sec. 181), as amended. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., on or before 1 p. m. of the date set out herein. Each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank or by money order made payable to the order of the Treasurer of the United States, and file a showing of citizenship and interests similar to that required under 43 CFR 192.42 (e) (4) and (f) Circular 1782. The envelopes should be plainly marked that they are not to be opened before the date and hour set out herein, and should show the number of the parcel and the name of the field. No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental must be paid and an acceptable surety bond in the sum of at least double the amount of rental, but in no case less than $1,000 nor more than $5,000, must be furnished by a successful bidder prior to the issuance of a lease. An acceptable $5,000 surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 1860, Title 18, U. S. Code, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil, and 12½ per cent to 16⅔ per cent for gas, in accordance with Schedule B in the lease form. Annual rental will be at the rate of $1 per acre. The lands are in the known geologic structure of the Salt Lake field, New Mexico, and are offered in one parcel described as follows: T. 20 S., R. 33 E., N.M.P.M. sec. 7, lots 2, 3, 4, SE¼NW¼, E½SW¼, S½NE¼, SE¼; sec. 18, N½NE¼, 559.47 acres. These tracts are within the recently designated "potash area" and the successful bidder will be required to execute the stipulations set out in section 1 (e) of the Departmental notice of October 16, 1951. A copy of the stipulations may be secured from the Manager of the Land and Survey Office, Santa Fe, New Mexico, or this office. With reference to the bond requirement, if the successful bidder has an approved full nation-wide bond in the sum of $150,000, or an approved nation-wide bond covering public domain lands for the State of New Mexico, no additional bond will be required. Bids must be submitted on or before 1 p. m., E.S.T., February 20, 1952. Marion Clawson, Director.

LEGAL

701.03 ACRES of Allotted Indian lands located in Townships 12, 13 and 14 South, Ranges 21 and 15 East, SLBM, within the jurisdiction of the Uintah and Ouray Reservation, Utah, are being advertised for lease, bids on which will be opened January 31, 1952, at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

LEGAL

1,902.89 ACRES of Tribal Indian lands located in Township 4 South, Range 2 West, USBM, on the Uintah and Ouray Reservation, Utah, are being advertised for oil and gas lease, bids on which will be opened January 25, 1952, at 2:00 P.M., at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

LEGAL

7,190.05 ACRES of Tribal Indian lands located in Township 4 South, Range 5 West, USBM, on the Uintah and Ouray Reservation, Utah, are being advertised for oil and gas lease, bids on which will be opened January 25, 1952, at 2:00 P.M., at the office of Forrest R. Stone, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from Mr. J. R. Schwabrow, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

ADVERTISERS IN THIS ISSUE

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that the lands listed herein are offered through sealed bids on the terms hereinafter specified, to qualified bidders of the highest cash amounts per acre, as a bonus for the privilege of leasing the lands under sec. 17 of the Leasing Act of February 25, 1920 (41 Stat. 437; 30 U.S.C. sec. 181), as amended. All bids must be submitted to the Director, Bureau of Land Management, Washington, D. C., on or before 1 p. m. of the date set out herein. Each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank or by money order made payable to the order of the Treasurer of the United States, and file a showing of citizenship and interests similar to that required under 43 CFR 192.42(e) (4) and (f) Circular 1782. The envelopes should be plainly marked that they are not to be opened before the date and hour set out herein, and should show the number of the parcel and the name of the field. No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental must be paid and an acceptable surety bond in the sum of at least double the amount of rental, but in no case less than $1,000 nor more than $5,000, must be furnished by a successful bidder prior to the issuance of a lease. An acceptable $5,000 surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bid. Bidders are warned against violation of section 1860, Title 18, U. S. Code, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil, and 12½ per cent to 16⅔ per cent for gas, in accordance with Schedule B in the lease form. Annual rental will be at the rate of $1 per acre. The lands are in the known geologic structure of the Square Lake field, N.M.P.M., New Mexico, and are offered in one parcel, described as follows: T. 16 S., R. 30 E., sec. 25, NE¼; T. 16 S., R. 31 E., sec. 30, lots 1, 2, 3, 4, E½W½; sec. 31, lot 4, SE¼SW¼, 513.56 acres. Bids must be submitted on or before 1 p. m., E.S.T., March 5, 1952. With reference to the bond requirement, if the successful bidder has an approved full nation-wide bond in the amount of $150,000, or an approved nation-wide bond covering public domain lands for the State of New Mexico, no additional bond will be required. Marion Clawson, Director.

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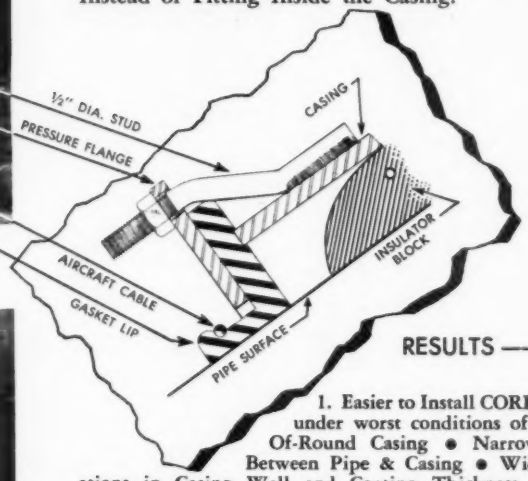
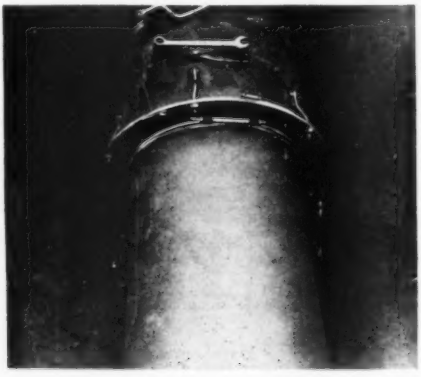
PIPE-LINE TESTED, PROVED and ACCEPTED in '51

Assembling cable with rubber-covered union for clamping gasket lip to pipe.

TYPE "L" WmSEAL CASING BUSHING*

A New Design: It BUTTS Against End of Casing Instead of Fitting Inside the Casing.





THE COMPLETED INSTALLATION
Note that galvanized cable and union are insulated from pressure flange and from pipe.

RESULTS —

1. Easier to Install CORRECTLY under worst conditions of • Out-Of-Round Casing • Narrow Space Between Pipe & Casing • Wide Variations in Casing Wall and Coating Thickness • Mud • Casing ends beveled — by machine or hand torch.
2. WATER-TIGHT Seal with "L" gasket . . . . . .
   - BUTTED AGAINST CASING as pressure flange is tightened on ½" studs welded to casing.
   - TIGHT TO THE PIPE as aircraft cable (4,600# tensile) is tightened to gasket lip. Union is rubber covered to INSULATE galvanized cable assembly from bare casing structure.
3. Always Insulated from the pipe line when a Concentric-Support Insulator is installed just inside casing after the "drag section" is in place.

AS STRONG & DEPENDABLE AS THE MEN WHO INSTALL THEM

REPRESENTATIVES

Stuart Steel Protection Corp. Plainfield, New Jersey | H. E. Davis Los Angeles 15, Calif. | James S. Kone Co. Amarillo, Texas | Keyes Tank Co. Provo, Utah | Keyes Tank & Supply Co. Casper, Wyoming | Canadian Equipment Sales & Service Co., Ltd. Edmonton, Calgary, Toronto, Canada

WRITE FOR COMPLETE INFORMATION

*Patent Pending

THE PIG WITH THE POKE CLEANS PIPE LINES

T. D. Williamson, Inc.
TULSA 9, OKLAHOMA

TRU-LAY
Preformed
WIRE ROPE

It handles easier—it's safer
to use. It performs better
and it lasts longer, too.
This means fewer changeovers.
Men who use it seldom switch.
If you haven't tried TRU-LAY
do so on your next job.

ACCO

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

AMERICAN CHAIN & CABLE
AMERICAN CABLE DIVISION

In Business for Your Safety

ALSO MAKERS OF THE COMPLETE LINE OF
ACCO Registered
WIRE ROPE SLINGS

Ten Times Through The Earth!

The footage drilled by Hughes Rock Bits since the industry's first rock bit was introduced by Hughes 43 years ago exceeds 420,000,000 feet—more than ten times through the earth.

That represents the greatest rock bit drilling experience in the industry!

More footage has been drilled with Hughes Rock Bits in more formations, under more varied conditions, than with all other rock bits combined.

This rock bit performance experience, coupled with continuous research and the close co-operation of the drilling industry, enables Hughes to design and perfect bits that *assure faster hole and more hole per bit!*

That's why Hughes Rock Bits are recognized as the standard of the industry throughout the world.

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